NAVAL POSTGRADUATE SCHOOL
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THESIS

A STATISTICAL ANALYSIS OF OFFICER RETENTION IN THE U.S. MILITARY

by

Turgay Demirel

March 2002

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This thesis examines the effect of officer commissioning sources on the retention of officers at two different career points: (1) At the end of the initial service obligation (MSR), and (2) at ten-years of service. The goal of this study is to help policymakers in setting and implementing personnel policies by providing information on the effectiveness of each commissioning program. The Defense Manpower Data Center in Monterey, California, provided the data file used in the analysis of officer retention. The data file contained longitudinal information on the population of officers who entered the military between 1985 and 1995. Logit regression models were used to analyze officer retention at MSR and at the ten-year point. Results indicate that retention behavior varies across commissioning programs. Significant differences in retention are observed among graduates of the Service Academies, ROTC Scholarship and ROTC Non-scholarship Programs, Officer Candidate/Training Schools, and Direct Appointment Programs. The differences are observed for all services combined and for each individual service. In most of the models, commissioning source variables are significant; however, the magnitude differences in retention between the five major commissioning sources often are not large. Moreover, the direction of the retention effect often varies across the services for each commissioning program. Further research on officer commissioning programs is recommended to include individual preferences and job satisfaction in the analysis of officer retention.

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A STATISTICAL ANALYSIS OF OFFICER RETENTION IN THE U.S. MILITARY

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Submitted in partial fulfillment
of the requirements for the degree of

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ABSTRACT

This thesis examines the effect of officer commissioning sources on the retention of officers at two different career points: (1) At the end of the initial service obligation (MSR), and (2) at ten-years of service. The goal of this study is to help policymakers in setting and implementing personnel policies by providing information on the effectiveness of each commissioning program. The Defense Manpower Data Center in Monterey, California, provided the data file used in the analysis of officer retention. The data file contained longitudinal information on the population of officers who entered the military between 1985 and 1995. Logit regression models were used to analyze officer retention at MSR and at the ten-year point. Results indicate that retention behavior varies across commissioning programs. Significant differences in retention are observed among graduates of the Service Academies, ROTC Scholarship and ROTC Non-scholarship Programs, Officer Candidate/Training Schools, and Direct Appointment Programs. The differences are observed for all services combined and for each individual service. In most of the models, commissioning source variables are significant; however, the magnitude differences in retention between the five major commissioning sources often are not large. Moreover, the direction of the retention effect often varies across the services for each commissioning program. Further research on officer commissioning programs is recommended to include individual preferences and job satisfaction in the analysis of officer retention.

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I would like to thank to my wife for her support and love that kept me strong all the time. This thesis is dedicated to my wife, Tuba.

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I.   INTRODUCTION

> In an all-volunteer force, people choose to enter and whether or not to remain in the military…. Today, this country is not attracting and retaining enough people of the kinds needed to staff an increasingly higher-skilled force, even though the force size is smaller today than it was before World War II.
> --U.S. Senator Trent Lott of Mississippi, on military pay fixes. (*Navy Times*, 1998, September 7, p.6)

Force structure of the U.S. military changes continually to cope with perceived future threats. Instead of fighting the last war, the military wants to recognize political, technological and economic reforms and change its force structure accordingly. Until the 1950s, the United States and many other countries relied upon the draft for maintaining mass armies. The U.S had to secure a large standing military force of conscripts until the end of the Vietnam War. The opposition against the war in Vietnam was one of the primary reasons leading to the all-volunteer force in 1973. The end of the draft created serious personnel recruitment difficulties for the armed forces of the U.S. Recruitment and retention have been important personnel matters of the all-volunteer force since 1973 [Ref. 1].

After the fall of the Soviet Union, military personnel levels and the U.S. defense budget declined substantially due to technological advances and the perceived reduction in the military threat. During the draft years of the cold war, the size of the active-duty force was 2.6 million, but by 2000 the active-duty force had fallen to 1.4 million. Also, defense spending, which was six percent of the Gross National Product in the mid-1980s, was reduced to less than three percent of the Gross National Product by 2000 [Ref. 19].

Figure 8 and Figure 9 in Appendix A show military personnel end strength from FY1973 to FY1999. Tables 25 through 27 show continuation rates of officers (FY 1998, 1999 and 2000), military personnel strength (FY 89 through FY00) and officer accessions by commissioning source over time (FY90 through FY00).

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A.   STATEMENT OF THE PROBLEM

Commanding the forces of the world's only superpower is a very challenging profession. Therefore, officers are key components of the armed forces, and each of the four services of the U.S. Armed Forces wants to recruit and retain the highest quality individuals. The military cannot remain a powerful fighting force without attracting and retaining high quality people. However, the process of attracting and retaining the most qualified and brightest youth to military careers has been a challenge. Several trends have affected the recruitment process [Ref. 1]:

1. Military Trends:

- Technological advances in military equipment increase the need for recruiting the most capable individuals. Current advancements in the technological revolution assure that the retention of qualified personnel is essential to a powerful defense structure and increase the need for technical and analytical skills.

- The assessments of the future security environment, such as potential threats and military technology, determine the defense strategy and the size of the armed forces. Since the drawdown of forces, reduced force levels have had an offsetting impact on shortages in the officer communities of all four service branches of the U.S. military. Today, end-strength goals are being roughly met.

- Because of the substantial reductions in the defense budget the military wants to do more with fewer resources. Also, pecuniary (pay, retirement and health-care benefits) benefits and non-pecuniary benefits affect officer retention.

2. Civilian Trends:

- American public may lose interest in military affairs. As in the case of the Vietnam War people might not want to join the military because of their opposition to war.

- A robust economy and low unemployment rates induce individuals to look for jobs with better monetary benefits in the private sector instead of in the military.

- Private sector demands high quality and skilled individuals as much as military does. The demand creates a competition between private sector and military.

The costs and quality of officer commissioning programs are very important considerations for the Department of Defense (DOD) in meeting retention goals. The officer corps of the U.S. military is a mix of different officer commissioning sources such as the Service Academies, Reserve Officer Training Corps (ROTC), Officer Candidate and Training Schools, Direct Appointments, and enlisted-to-officer Commissioning Programs. Each of the commissioning sources has advantages and disadvantages. For example, Service Academies provide a steady and reliable flow of highly-trained annual accessions into the officer corps but cost more than the other accession sources. ROTC programs are less costly than Service Academies but lack the intensive leadership and military ethic training. Officer Candidate and Training Schools are very flexible commissioning sources, and are used to meet the needs associated with rapid mobilizations or demobilizations. However, these schools provide only limited training in leadership and military-specific subjects.

This study focuses specifically on the effects of the various commissioning sources on the retention of officers. For this study, the most significant question is whether graduates of the individual commissioning programs reveal different retention behavior at key career points. Many factors may influence the retention of officers. Individuals may decide to leave the service for several possible reasons:

- A Strong Economy: Military compensation may be uncompetitive with the civilian marketplace and prevent the armed forces from retaining highly qualified personnel. The draw of better paying jobs in the civilian marketplace continues to reduce retention;

- Organizational Factors: Officers may be dissatisfied with the pay, retirement and healthcare benefits or quality of life in the military. Officers may not be motivated enough to stay; and

- Personal Demographics: Characteristics such as age, tenure, sex, race, marital status, education, etc. may affect an individual's decision to stay in the military.

B. OBJECTIVE AND RESEARCH QUESTIONS

1. The Objective

The primary objective of this study is to examine the effects of commissioning source on the retention of officers at the end of obligated service, and at ten years of service. Although the thesis examines some of the costs and benefits of each commissioning program, it does not attempt to optimize the mix of accessions from various officer-commissioning sources.

2. Research Questions

The following research questions are addressed after a brief introduction to the U.S. officer commissioning programs:

- Does the commissioning source affect retention decisions of officers who are at the end of their obligated service and at ten years of service?
- Does the retention effect associated with each commissioning source vary among the four service branches?
- Does the retention effect vary across officer communities within each branch?
- Which commissioning sources appear to be more cost-effective?

C. SCOPE, LIMITATIONS AND HYPOTHESIS

Officers who are at the end of their initial obligated service and who reach ten years of service are the focus of this study. The data set used in the study includes officers who entered the military between 1985 and 1995 with the exception of those who have missing data records. This thesis analyzes retention as a binary decision. The retention decision is defined as either staying in the service until completing the initial obligated service period or leaving or staying past ten years of service or leaving. The reasons for separation (voluntary or involuntary) are not reviewed.

An analysis of the separation propensity of officers may provide policy makers with useful information in making choices on the number of officer accessions acquired

from each source. However, the thesis does not have sufficient information to determine the optimal mix of officer accessions.

D. ORGANIZATION OF THE STUDY

This study is organized into five chapters. Chapter II examines officer commissioning sources and reviews applicable studies on job turnover, officer retention and commissioning sources. Chapter III discusses the data and also includes a discussion of the methodology used to analyze the data. Chapter IV presents the results of the statistical analysis. Chapter V summarizes the conclusions and recommendations based upon the statistical analysis. Areas of further research are also included in this final chapter.

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II.   LITERATURE REVIEW

This chapter is divided into seven sections. The first section discusses the turnover concept and relevant literature concerning retention. The first section also addresses recent studies regarding comparisons of the marginal and average costs of commissioning officers through the service academies, Reserve Officer Training Corps and Officer Candidate/Training Schools. The second section serves as an introduction to the various officer-commissioning sources. The last five sections thoroughly describe the Service Academies, Reserve Officer Training Corps (ROTC), Officer Candidate and Training Schools, Direct Appointments, and Enlisted-to-Officer Commissioning Programs, which are the primary officer commissioning sources.

The US military has experienced critical changes in personnel levels since the drawdown of forces began in 1989. With a full-scale war not being a considerable threat anymore, military manpower and budget was decreased by 41 percent after the Cold War.[1] Several military bases around the world have either been closed or consolidated as a part of the force structure reduction. However, the military's need for attracting high-quality individuals has not decreased. On the contrary, it has increased. Indeed, the drawdown of forces has given priority to getting qualified people to serve in the military [Ref.1].

The officers corps sustains the United States' role as the only remaining superpower and global leader of the 21st century. Officers are the leaders and managers of the numerous forces deployed in operations ranging from disaster relief and peacekeeping to deadly combat missions in countries such as Bosnia, Haiti, Macedonia, Turkey, and Northern Iraq.

Nowadays, officers of the United States military have to confront increasingly complex challenges and handle revolutionary changes in the military profession. Technological advances make understanding and employing the means of warfare more difficult than ever. The results of advancements in technology are vitally important for

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[1] Currently, the defense budget is at its lowest level since Pearl Harbor [Ref.1].

the military forces of the United States. In the Information Age, the effect of the technological revolution is immensely important to the military. Failing to employ the latest technologies effectively could mean the difference between winning and losing a war. As a result, the U.S. Department of Defense has to make crucial assessments of future global security problems and consider the effects of the technological revolution on the military. These assessments should include the education and training of officers and the role of military and civilian schools as the providers of military education and training to U.S military servicemembers.

Today, extensive cuts to the defense budget continue to create intense budgetary pressures. Because of the consequent reductions in the defense budget for the last eleven years, the U.S. Congress has discussed several proposals to substitute service academies with Officer Candidate Schools and Reserve Officer Training Corps programs, to close the service academies or to combine them into one military institution.

Substantial reductions in the defense budget and personnel levels prompt a need to analyze all DOD institutions carefully in order to allocate scarce resources rationally. Any military foundation failing to maintain its part of resources faces extinction. Even though the U.S military education system is one of the finest in the world, examining admission programs and the performance of its educational institutions is reasonable for the U.S. military.

This study focuses on the issue of assessing where military education has been in the past, where it is now, and where it should be in the future. Answering the following questions may help explain the current status of professional military education:

- What are the assessed needs of the U.S military with regard to the skills and knowledge that each commissioned officer should have upon graduation from college?

- Can the DOD expect potential savings from the current military education system?

A. PREVIOUS RESEARCH ON TURNOVER AND OFFICER COMMISSIONING SOURCES

Job turnover, the voluntary separation of an individual from an organization, is a very popular topic in industrial/organizational research. Price (1977) defines "turnover" as the degree of individual movement across a social system.

> Individual movement across the membership boundary includes 'accessions,' such as new hires and 'separations,' such as quits, layoffs, and discharges [Ref.2].

Job turnover can also be defined as the voluntary or involuntary withdrawal of an employee from an organization. Employees who are offered better opportunities or who are not satisfied with the present organization may prefer leaving an organization at pleasure. Employees with health, family, or external economic problems may have to leave an organization involuntarily. The separation decision may originate from the individual or the organization. For organizations, turnover may decrease productivity and manpower and increase training costs [Ref.3].

Although many researchers regard voluntary turnover as a result of job dissatisfaction, turnover cannot be explained merely by satisfaction. Knowing the exact reason for separation is often difficult. For example, an unsatisfied employee may stay in the organization no matter how difficult the situation. Or an employee may want to leave even without any apparent dissatisfaction. Such examples indicate that satisfaction and turnover may exist independently [Ref.3].

Organizations naturally want to reduce the adverse effects of turnover. Identifying factors that lead individuals to a separation decision is a very important step in any organization's fight against turnover. The predictors of turnover can be grouped into three categories:

- Variables based on individual perceptions such as job satisfaction, organizational commitment, behavioral intentions,
- Variables representing personal and demographic characteristics such as age, tenure, sex, and education,

- Situational variables such as organizational and workgroup level characteristics.

The outcomes of turnover may be negative or positive for both the individuals and the organizations. The most likely positive consequences of turnover for organizations are increased innovation, employee motivation and morale, and overall effectiveness. The negative outcomes may include administrative costs such as expenses for recruitment, selection, training, and development. Also, the demoralizing effect of job turnover on current employees is widely accepted by most researchers. Individuals can experience positive economic and job-related benefits such as improved job situation or a better fit between the job and the individual. However, the likelihood of losing seniority and nonvested benefits are high for individuals. Also, separation may harm social relationships of individuals and cause stress [Ref.4].

Previous research concerning the effect of commissioning sources on the retention of officers and economic costs and benefits of commissioning sources is limited. In one of the most recent studies, Marvin M. Smith (1990) analyzed the program cost and performance of commissioned officers. He discovered that, measured in terms of costs to the DOD, the average cost of an academy graduate ranged from $153,000 to $229,000 in 1989. For ROTC scholarship programs, the average cost per commissionee was much lower, ranging from $53,000 to $58,000 in the three services. OCS/OTS costs per commissionee ranged between $15,000 and $20,000 for all three services [Ref.5]. Table 1 shows the average cost per graduate in 1989 (in dollars) for the three services.

Table 1.   DOD Average Cost per Graduate in 1989 (in dollars)

	Army	Navy	Air Force
Academy	$229,000	$153,000	$225,000
ROTC (Scholarship)	$55,000	$53,000	$58,000
OCS/OTS	$15,000	$20,000	$18,000

Source: Smith (1990)

Smith related the large difference between the costs of Naval Academy graduates and the other two academies' graduates to the size of the physical plants and the benefits offered to academy employees. The Military Academy and Air Force Academy have, respectively, 16,000 and 18,000 acres of land; the Naval Academy has less than 1,000

acres. Also, the Naval Academy provides less housing and medical care for its faculty, which is largely civilian. By contrast, the faculty of West Point and Colorado Springs are much more heavily populated by military personnel.

Another important finding of Smith was the sharp differences in costs among the three commissioning programs. Officer Candidate School, the least costly of the three commissioning programs, spends only 6 to 13 percent as much as academies and only 25 to 33 percent as much as the ROTC scholarship program. However, the costs presented in Table 1 may be misleading because the cost differences are overstated by neglecting the full social costs of educating ROTC and OCS/OTS graduates, such as the portion of operating costs at state universities supported by state taxpayers. If the full costs were included, then costs per graduate among the various commissioning sources would be much closer than those in Table 1.

In another study, Ping-Hsiung Lo (1997) analyzed U.S. military officers commissioned through the service academies and ROTC programs by using 1977 cohort files supplied by DMDC. Lo discovered that for officers who are at the end of their obligated service, the Air Force Academy and Air Force scholarship graduates had the highest retention rate of 93.5 percent and 69.8 percent, respectively, followed by the Air Force non-scholarship graduates with 69 percent. The retention rate of Naval Academy graduates was 85.3 percent. The Military Academy graduates had the lowest retention rate at 83.7 percent [Ref.6].

B.   INTRODUCTION TO U.S. OFFICER COMMISSIONING SOURCES

Every individual who considers the military as an occupation must decide which way to enter. New officers can join the military through one of four primary ways, which represent the general infrastructure of U.S. officer corps. These four ways are via

1.   Service Academies
2.   The Reserve Officer Training Corps (ROTC)
3.   Officer Candidate School/Officer Training School (OCS/OTS)
4.   Direct Appointment

Figure 1.   Typical Methods of Becoming an Officer in the Military
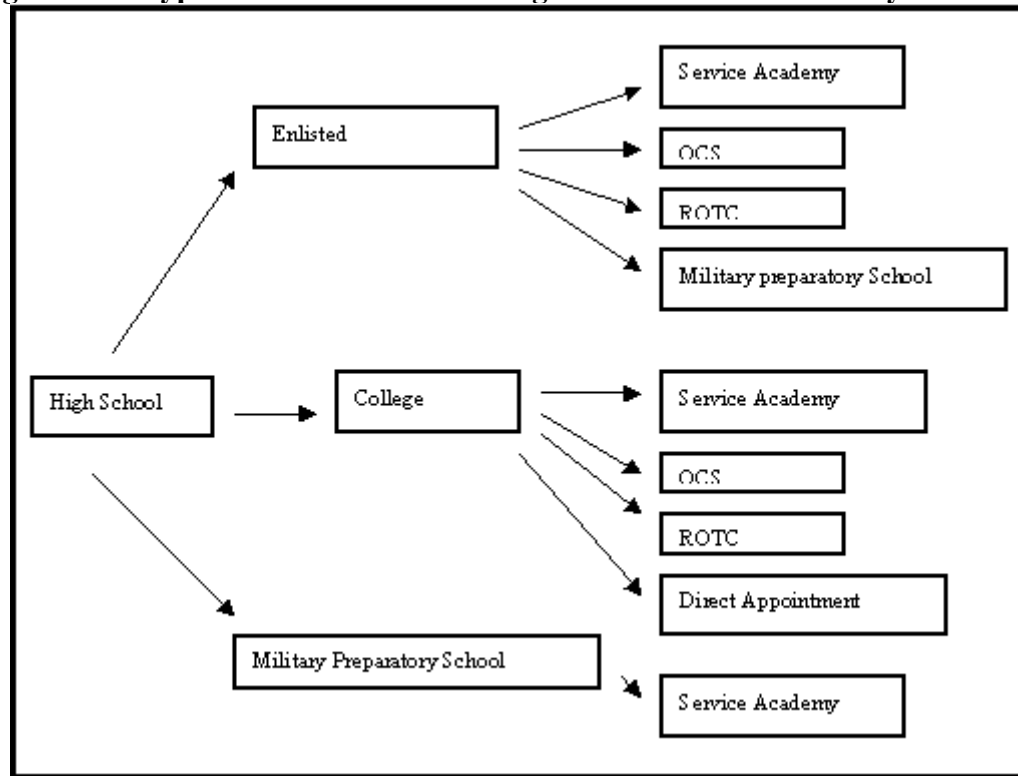
Source: Rand (1999, Figure 3.2, Page 13)

Figure 1 shows the choices available to individuals. Personal preferences and background characteristics influence the decision of several other choices:

- Whether to be an officer or an enlisted service member,
- Whether to serve in the active-duty forces or in the reserves,
- Whether to be a member of the Army, Navy, Air Force or Marine Corps.

At the moment, 85 percent of the military is composed of enlisted service members and warrant officers. The remaining 15 percent are officers.

C.   SERVICE ACADEMIES

Unlike the fast and overly intensive crash courses of Officer Candidate Schools, the service academies present intensive four-year programs to their cadets and midshipmen. The military drill and athletic courses together with the academic program make service academies unique sources of commissioning officers. Cadets and

midshipmen are introduced to military traditions and cultures for the first time in the service academies. The service academies transmit the military culture and ethic into the officer corps.

Congress (representatives, senators, and delegates) makes 75 percent of the academy appointments. The remaining 25 percent is under the control of the U.S. President or the services. Every year, between 10,000 and 15,000 candidates apply to the service academies. However, only 15 or 20 percent of these highly qualified men and women receive admission into the academies. SAT averages of the academy applicants are around the 1200s, which is above the average national SAT score.

The Federal Government maintains the three service academies of the United States Armed Forces:

- The United States Military Academy at West Point, New York
- The United States Naval Academy at Annapolis, Maryland
- The United States Air Force Academy at Colorado Springs, Colorado

The Marine Corps does not have a service academy. Up to one sixth of the Naval Academy graduates may be commissioned officers in the Marines each year. Section D of DOD Directive 1322.22 states the purpose of the academies as:

> To provide an annual influx of career-motivated officers and future leaders into each Service. Those officers shall be immersed in the traditions and professional values essential to the institutional character of the U.S. Armed Forces [Ref.7].

The student body of each DOD service academy is 4,000. About 900 to 1,000 new officers are graduated and commissioned from each academy every year. Academy graduates receive Bachelor of Science degrees upon graduation [Ref.7].

1.   **U.S. Military Academy**

Candidates must meet general eligibility requirements for admission into the Military Academy. Eligible applicants must obtain a nomination from an authorized source before they are permitted to take the required academic and physical examinations. Academy appointments can be classified as: Congressional, Competitive, Sons of Veterans Awarded the Congressional Medal of Honor, and Foreign Cadets [Ref.8].

Admission requirements for U.S. Military Academy are as follows:

a.   *General Eligibility Requirements*

- Must be between 17 and 23 years of age,
- Must be of good moral character,
- Must be a citizen of the United States (except for certain students appointed as foreign students),
- Must be unmarried (Divorced individuals are ineligible),
- Cannot be pregnant or have a legal obligation to support children [Ref.8 and 9].

b.   *Academic Qualifications*

The academic qualification is based on two considerations:

- An above-average high school or college academic record,
- Strong performance on the standardized American College Testing (ACT), the College Board Admissions Testing Program Scholastic Assessment Test (SAT) or Assessment Program Exam [Ref.8 and 9].

c.   *Medical and Physical Qualifications*

- Must be in good physical and mental health and must pass a medical exam,
- Must have above-average strength, endurance and agility and must demonstrate adequate performance on the USMA Physical Aptitude Exam [Ref.9].

2.   U.S. Naval Academy

The mission of the Naval Academy is to develop midshipmen as officers dedicated to a career of naval service and to provide properly educated and trained officers for the naval service [Ref.8].

Candidates must meet general eligibility requirements and must obtain a nomination from an authorized source before they are permitted to take the required academic and physical examinations [Ref.8].

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- Must be unmarried (Divorced individuals are ineligible),
- Cannot be pregnant or have a legal obligation to support child, children or other individual(s) [Ref.8 and 10].

b.   Academic Qualifications

The Naval Academy requires candidates to take the Scholastic Assessment Test (SAT-I) or the American College Test (ACT) prior to admission, to demonstrate superior high school performance (3.5+ GPA (4.0 scale) or equivalent), to rank in the top 20 percent of the class, and to pass the PSAT, SAT, or ACT [Ref.8 and 10].

c.   Medical and Physical Qualifications

All candidates are required to undergo a thorough medical examination, because the Naval Academy program is physically challenging. The Department of Defense Medical Examination Review Board (DODMERB) schedules candidates' medical examination and reviews the report very carefully to determine whether candidates meet the medical standards for admission. DODMERB considers candidates' medical history and information on illnesses, injuries, surgery, the familial diseases, and

other factors that could affect one's physical condition. Candidates might be asked to submit additional records from physicians or hospitals. Each candidate should be physically fit and in good health with normal vision and demonstrate adequate performance on Naval Academy Physical Aptitude Exam [Ref.10].

3.   U.S. Air Force Academy

The mission of the Air Force Academy is to inspire and to develop outstanding young men and women to become Air Force officers with knowledge, character, and discipline [Ref.11].

a.   *General Eligibility Requirements*

- Must be between 17 and 23 years of age,
- Must be of good moral character,
- Must be a citizen of U.S. (except for certain students appointed as foreign students),
- Must be unmarried and cannot have any dependents [Ref.11].

b.   *Academic Qualifications*

Academic performance constitutes the major portion of the evaluation. The composite score includes grades in high school and any college courses taken, rank in class, and college admission test scores. The math ACT and SAT scores count more heavily than English. There is extra credit for honors and advanced placement courses. The SAT verbal and math averages for those entering the USAF Academy are 626 and 652, respectively [Ref.11].

c.   *Medical and Physical Qualifications*

Candidates for the Air Force Academy must pass both the Academy Qualifying Medical Examination and the Physical Aptitude Examination. All academies and commissioning sources use one general standardized examination to determine medical qualifications [Ref.8 and 11].

D. THE RESERVE OFFICER TRAINING CORPS (ROTC)

The Reserve Officer Training Corps started with the Land Grant Act of 1862. The Land Grant Act required all colleges receiving land grants from the federal government to offer military training. The National Defense Act of 1916 established the ROTC program to reinforce the academies and to provide officers for the reserve forces. The ROTC Vitalization Act was enacted in 1964 and established the two- and four-year ROTC programs available for all colleges and universities [Ref.12].

Like Officer Candidate and Officer Training Schools, ROTC was initially formalized as a means of filling the gap in the officer corps at times of mobilization. Today, all four-service branches of the United States military maintain ROTC programs in order to train competent applicants to become officers upon graduation. More than 1,000 colleges and universities throughout the U. S. offer ROTC programs. This makes the ROTC the largest source of commissioned officers. Thousands of military officers participate in the ROTC programs in hundreds of college campuses throughout the U.S. ROTC involves a regular college education supplemented by military training and courses. The length of this training may vary from two to four years. ROTC students wear uniforms once a week.

The titles of the Army, Navy and Air Force ROTC programs are *Military Science, Naval Science* and *Aerospace Studies,* respectively. Military science, aerospace studies, and naval science are recognized electives, and students may choose to pursue Army, Air Force, or Navy curricula.

Scholarships are not a requirement for admission into the ROTC programs. However, scholarships help hundreds of students to enroll in ROTC programs. Scholarships are awarded on merit. The services examine applicants' SAT or ACT scores and high school academic record when offering scholarships. Applicants' extracurricular activities history and a personal interview can also affect the scholarship decision. The ROTC scholarships differ in length, value, and terms by service.

Four-year scholarships including full tuition, books, fees, and a monthly tax-free stipend are common among all services. Some services offer scholarships less than four years (three-, two-, and one-year scholarships).

The four-year program is separated into two phases—the freshman/sophomore phase and the junior/senior phase. The Army calls these two phases the *Basic* and *Advanced Course*; the Air Force calls them the *General Military Course* and the *Professional Officer Course.* Students who have completed the freshman/sophomore phase must take the Air Force Officer Qualifying Test for the Air Force program and the Officer Selection Battery for the Army program to apply for the junior/senior phase. Those who qualify for a commission are selected for enrollment.

Junior-college graduates, transfer students, and students who did not enroll in the freshman/sophomore phase may enroll in the two-year program. Applicants for the two-year program may enter the junior/senior phase after the successful completion of a six-week summer training period.

The U.S. military relies heavily on the Reserve Officer Training Corps (ROTC) to supply its officer corps with new officers. The all-volunteer military force draws its power and direction from American Society. ROTC is the vital link between American Society and the all-volunteer military force. The ROTC provides diversity to the U.S. military by attracting officers from all different socio-economic and geographical backgrounds into the armed forces. Don Snider, the Olin Chair in National Security Studies at the U.S. Military Academy says:

> Because its graduates are so representative of the entire nation, ROTC is perhaps the most visible sign of the implied contract, which exists between our society and its military forces. Especially in an all-volunteer force, ROTC represents a key foundation of the civil-military structure [Ref.1].

1. Army ROTC

Most universities that have Army ROTC offer a four-year program. The program of instruction consists of two phases: The Basic Course (taken in freshman and

sophomore years) and the Advanced Course (taken in junior and senior years). The Basic Course matches with the first two years of a four-year academic program at a university. ROTC classes are considered college electives. Basic Course teaches Basic Leadership Development, Basic Military Skills, Adventure Training, Life Skills, Army History, organization and structure. Completing the Basic Course is obligatory for enrollment in the Advanced Course. The Advanced Course focuses on tactical operations and military instruction, Advanced Leadership and Management Skills, Advanced Tactics, and Army Ethics. The Advanced Course students join a six-week summer training camp during the summer between the third and fourth years [Ref.13].

Students completing the Army ROTC program with a bachelor's degree qualify for a commission as a second lieutenant in the Army. ROTC cadets do not incur military service obligation during the first two years (or the first year in the case of scholarship winners).

The Army awards ROTC scholarships every year. ROTC scholarships are awarded on merit (academic and extracurricular achievements), not financial need. Scholarships may be up to $80,000 a year. The allowance amount paid to scholarship winners may be as high as $1,500 a year [Ref.13].

The Army ROTC offers two- and three-year scholarships in addition to its regular four-year scholarship program. ROTC scholarships pay tuition and academic-related fees plus $150 per month while the student is enrolled in Military Science.

General eligibility requirements to receive an Army ROTC scholarship are
- Must be a United States citizen,
- Must be between 17 and 27 years of age,
- Must be a high school graduate or possessing an equivalent certificate,
- Must have no moral obligations or personal conviction against supporting and defending the Constitution of the United States and conscientiously bearing arms,
- Must satisfactorily explain any record of arrest and/or civil conviction,
- Must have a minimum high school GPA of 2.5,
- Must have a minimum SAT score of 920 or an ACT composite score of 19,

- Must pass Department of Defense Medical Examination Review Board (DODMERB) medical examination.

The Army considers the following factors in the granting of scholarships:

- SAT and ACT scores (Most often scores are between 920-1,600 on the SAT and 19-35 on the ACT. The average SAT was 1,242 and 28 ACT in 1999),

- High school academic standing (Winners fall in the top 25 percent of their class mostly),

- High school GPA of 2.5 or higher,

- Extracurricular participation and athletic activities, and leadership positions held,

- Three school officials' evaluations, and personal interview by an Army officer.

Eligible applicants must also pass the Army Physical Fitness Test (APFT) to receive scholarship benefits [Ref.13].

Commissions as a second lieutenant are awarded in most branches of the Army, and these officers go on to serve in the regular (active) Army, the U.S. Army Reserve, or the U.S. Army National Guard. ROTC graduates are required to serve on active duty or reserve duty (Army Reserve, or Army National Guard) for a period of eight years.

2. Navy / Marine Corps ROTC

The Naval Reserve Officers Training Corps (NROTC) Program started in 1926. The Marine Corps joined the NROTC Program in 1932. Currently, the NROTC Program is available at over 100 colleges and universities throughout the USA. The Navy and Marine Corps target 1050 and 225 ROTC commissions every year, respectively [Ref.14]

Students who enroll in a Navy ROTC (NROTC) unit, complete their required military courses, and obtain a bachelor's degree qualify for a commission as an ensign in the Navy or as a second lieutenant in the Marine Corps. Students enter the Navy-Marine Scholarship Program through a national selection process conducted by the Navy and Marine Corps and qualify for active-duty commission upon graduation.

Two-year forms of both the scholarship and non-scholarship programs are available in the NROTC program. The NROTC Scholarship Program is the largest single

source of Navy and Marine Corps officers. The NROTC Program aims to educate and train qualified applicants for service as commissioned officers in the unrestricted line Naval Reserve or Marine Corps Reserve. Selected applicants are awarded scholarships through a highly competitive national selection process. Scholarships include full tuition, books, fees and other financial benefits at many of the country's leading colleges and universities [Ref.14].

Scholarship winners are commissioned as naval officers upon graduation. Obligated service is at least four years active duty in the U.S. Navy. The scholarship pays for full tuition and includes financial benefits such as books, class fees and a $200 per month subsistence as well. Selection criteria for the NROTC scholarships are [Ref.14]

- Must be a U.S. citizen,
- Must be between 17 and 27 years old,
- Must be a high school graduate or possess equivalency certificate,
- Must have a minimum SAT test score of 530 verbal and 520 math or minimum ACT test score of 22 in both English and math,
- Must be physically qualified.

Scholarship nominees are required to pass a medical examination. Nominees must be medically qualified (or obtain a waiver) before scholarship benefits are paid.

The NROTC scholarship Marine Option program requires a minimum SAT test score of 1,000 composite or a minimum ACT test score of 45 (combined score of the English and math portions). All the other requirements are the same as the Navy four-year program.

The two-year scholarship program includes tuition, fees, textbooks, uniforms and a monthly $200 subsistence for a maximum of 20 academic months during the junior and senior years of college only. The two-year college program is a non-subsidized program covering uniforms and a $200 per month subsistence for 20 academic months during the junior and senior years of college only.

The Marine Option Naval Reserve Officer Training Corps program is aimed at educating and training highly qualified applicants as commissioned officers in the United States Marine Corps. The Marine Corps conducts two selection boards per year.

Selected applicants for the Marine Option NROTC Scholarship Program are awarded scholarships through a highly competitive national selection process and receive full tuition, books, fees and other financial benefits at many of the country's leading colleges and universities. Selection criteria are the same as the Navy ROTC program, except SAT and ACT minimum required scores [Ref15].

3. Air Force ROTC

Air Force ROTC is the largest and oldest source of commissioned officers for the Air Force. "In 1998, Air Force ROTC commissioned 1,977 cadets, representing 60.1 percent of all Air Force officers commissioned during that time period from the Air Force ROTC, the Air Force Academy and Officer Training School" [Ref16].

Students can pursue two general types of Air Force ROTC in college: the General Military Course (GMC) and the Professional Officer's Course (POC). The first two years of the Air Force ROTC four-year program is called the General Military Course. GMC is composed of one hour of classroom work and one to two hours of leadership laboratory each week. GMC concentrates on the professional aspects of the Air Force, communications training, the environment of the Air Force officer, and the development of air power. Participants of GMC do not incur any military service obligation [Ref16].

The final two years of AFROTC is called the Professional Officer's Course (POC). Participants who successfully complete General Military Course requirements may enroll in the Professional Officer Course (POC) after passing the Professional Officer Course selection system (POC selection system uses factors such as grade point average, unit commander evaluation and aptitude test scores). Selected applicants attend to a four-week field-training encampment at an assigned Air Force base before entering the Professional Officer Course.

POC is similar to the Army ROTC Advanced Course in nature. POC emphasizes leadership and management training and discussions on the role of air power in national defense. Cadets hold leadership positions in the cadet corps for at least one semester. POC students are entitled to a monthly $200 nontaxable subsistence allowance during the academic year.

The Air Force ROTC is offered at more than 900 colleges and universities throughout the U.S. Eligibility requirements for GMC scholarship applicants are [Ref.16]

- Must be enrolled full-time in an accredited college that hosts or has a cross-town agreement with an Air Force ROTC detachment if on scholarship,

- Must be a United States citizen,

- Must be in good physical condition,

- Must be of good moral character,

- Must be 14 years or older or 17 years old to receive a scholarship,

- Must attend both the Aerospace Studies class and Leadership Lab each semester.

Eligibility requirements for POC scholarship applicants are [Ref.16]

- Must meet all the GMC membership requirements,

- Must be in good academic standing,

- Must be physically qualified (meet Air Force Height and Weight Standards and pass the Air Force Physical Fitness Test (PFT),

- Must have a military certified/qualified physical,

- Must pass the Air Force Officer Qualifying Test (AFOQT)[2]

- Must be interviewed and selected by a board of Air Force officers,

- Must complete a Field-Training course.

The only difference between the Air Force ROTC two-year program (POC) and the last two years of the four-year program (GMC) is the entry procedure. Two-year program applicants must successfully complete a six-week field-training encampment. Applicants are not committed to the Air Force until the end of encampment.

The Air Force ROTC also has a one-year program as an alternative route to an Air Force commission. The program's purpose is to compensate for the gaps in the Air Force officer commissions. Selected applicants must join a seven-week Air Force ROTC field-training encampment during the summer before entering the first year of the Professional

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[2] The Air Force Officer Qualifying Test (AFOQT) is a standardized test similar to the SAT and ACT. The AFOQT measures aptitudes and is used to select applicants for officer commissioning programs.

Officer Course as a contract cadet. Graduates incur a four-year active-duty service commitment. Scholarships in the one-year program pay for full tuition, books and fees.

The Air Force ROTC offers four-year or three-year scholarships. All scholarship recipients receive a nontaxable stipend of at least $250 per month during the school year. The Air Force ROTC scholarship programs do not pay for room and board. The Air Force has three types of Scholarships [Ref.16]:

- Type 1 pays full college tuition, most lab fees, and $510 each year for books. Approximately 7.5 percent of the four-year scholarships are offered a Type-1 scholarship,

- Type 2 pays college tuition and most lab fees up to $15,000 and pays $510 each year for books. Approximately 17 percent of the four-year scholarships are offered a Type-2 scholarship. All three-year scholarships are Type-2,

- Type 7 pays full college tuition and most lab fees for colleges/universities where the tuition is less than $9,000 per year. These students also receive $510 each year for books.

All scholarship recipients and members of the Professional Officer Course (POC) must take and pass a Department of Defense Medical Examination Review Board (DODMERB) medical exam.

Table 2 summarizes the benefits of all ROTC programs in the U.S. Military. Only the Navy and Marine Corps scholarship programs pay for 100 percent of the costs. The Air Force Type 1 scholarship program pays 100 percent of tuition, but does not pay all fees.

Table 2.   ROTC Program Benefits

Table 3.3

ROTC Program Benefits

Category	Army	Navy/ Marine Corps	Air Force
Duration of scholarships	2–4 years	2–4 years	1–4 years[a]
Maximum level of scholarships	Tier 1a:[b] $20,000/year Tier 1:[c] $12,800/year Tier 2:[c] $9,000/year Tier 3:[c] $5,000/year Tier 4: $3,000/year for up to two years (junior and senior years)	Every scholarship is for full tuition	Type 1: full tuition and most fees Type 2: tuition and fees up to $9,000/ year for 4 years; allows increase up to 80 percent of tuition after freshman year Type 3: $2,000/year for up to two years as part of the Professional Officer's Course (junior and senior years)
Other scholarship benefits	All types of awards provide for books, most fees, and $1,500/year	All types of awards provide for books, most fees, and $1,500/year	All types of awards provide for books, most fees, and $1,500/year
Nonscholarship program	Provides uniforms, textbooks, and $150/month up to 20 months (junior and senior years)	Provides uniforms, textbooks, and $150/month up to 20 months (junior and senior years)	Provides uniforms, textbooks, and $150/month up to 20 months (junior and senior years)

[a]The 1-year scholarship is designed to meet production shortfalls in certain fields—currently, nursing and meteorological students in their junior year are eligible for this program.

[b]Tier 1a is only available at certain colleges and universities having higher-than-average tuition requirements. Examples of Tier 1a schools are Vanderbilt and Duke University. Generally speaking, the more generous scholarships are competitively awarded to students who are both (1) higher quality and (2) attending universities that have higher tuition.

[c]For limits on Types 1, 2, and 3 scholarships, see the AF Enlisted Website, http://www.afoats.af.mil/Opportunities/Enlisted/af-enlisted.htm.

Source: Rand (1999, Table 3.3, Page 18)

E.   OFFICER CANDIDATE / TRAINING SCHOOLS (OCS/OTS)

Officer Candidate Schools or Officer Training Schools are successful at filling the gaps in the officer corps during national emergencies. Compared to the other three commissioning sources, OCS is the most flexible one. These schools offer very intensive round-the-clock courses for commissioning officers swiftly. For the exceptional non-commissioned officers who have proved themselves in the enlisted ranks, Officer Training Schools and Officer Candidate Schools are also the gateways of admission into the officer corps [Ref.12].

Officer Candidate Schools emerged from the two voluntary training camps held for undergraduate college students during the period before the U.S. entered World War I. OCS participants are mostly college graduates. Only the Navy and the Marine Corps allow some candidates to enter without a four-year college degree or a bachelor's degree. OCS programs serve various purposes and target both enlisted personnel and civilians to become commissioned officers. The type of training given differs among the services' individual OCS programs but the length (between 10-16 weeks) and purpose of commissioning second lieutenants or ensigns are the same [Ref.12].

1.   ARMY OCS

Enlisted Soldiers on Active Duty and civilians who meet the minimum qualifications can apply for Army OCS.[3] The Deputy Chief of Staff for Personnel (DCSPER) administers the expanded OCS program. During partial and full mobilization, OCS educational requirements may be changed to allow high school graduates into Officer Candidate School. Army OCS graduates incur three years of active duty service in commissioned officer status.

Army regulation 350-51 states general eligibility requirements for Army Officer Candidate School as follows [Ref.17]:

- Must be a citizen of the United States and be of good character,
- Must have a general Technical Aptitude Test (GT) score of 110 or higher on the Armed Forces Vocational Aptitude Battery (ASVAB),

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[3] Army regulation 601-210 contains civilian eligibility criteria.

- Must pass the Army Physical Fitness Test (APFT),

- Must obtain a passing score on the Scholastic Aptitude Test (SAT) or American College Test (ACT). SAT and ACT passing scores are 850 and 19 or higher,

- Must have a minimum of 90 semester hours of study from an accredited college or university toward a degree and must be able to complete a bachelor degree within one year,

- Must have a score of 80 or higher on the English Comprehension Level Test (ECLT)/American Language Course Placement Test (ALCPT) if one's primary language is not English,

- Must be between 18 and 34 years of age (age is waiverable up to 39) and must have a complete physical exam six months prior to date of application.

2.   NAVY OCS

The thirteen-week long course in the Navy Officer Candidate School is very demanding both physically and mentally. The objective of the 14 units of instruction given at Navy OCS is to equip the candidates with basic naval academic and military knowledge. The minimum required active service period after graduation varies from four to eight years by the community or designator of the graduating officer. Eligibility requirements for admission into Navy Officer Candidate School are [Ref.18]:

- Must be a U.S. citizen and of good moral character,

- Must be at least 19 years old (maximum age at time of commissioning varies according to the designator),

- Must possess a bachelor's degree or higher from an accredited institution, in a field of study or major which satisfies requirements for the specific designator desired, and

- Must enter to the Officer Aptitude Rating (OAR) examination (OAR has no minimum score requirement). However, OAR scores below 40 are generally not competitive.

3. **AIR FORCE OTS / MARINE CORPS OCS / COAST GUARD OCS**

The Air Force refers to its twelve–week course as the Basic Officer Training (BOT) program at Officer Training School. BOT is an intense academic, physical, and military training program.

The U.S. Marine Corps Officer Candidate School is the second primary commissioning source of officers after the U.S. Naval Academy. The Marine Corps Officer Candidate School has several programs like the Officer Candidates Class, the Platoon Leaders Course, or the Naval Reserve Officer Training Corps.

The Coast Guard OCS is a seventeen-week course, which prepares candidates to serve effectively as officers in the United States Coast Guard. Having a bachelor's degree and meeting specific age and medical standards are required for admission.

F. **DIRECT APPOINTMENTS**

Direct appointments to the regular officer corps are usually reserved for individuals who have achieved professional degrees in medical, legal, and religious fields. Most direct appointments enter the services at higher ranks than do their officer counterparts, who have been commissioned through the academies, RTOC, or OCS/OTS.

The advanced grade is based on a constructive credit computation. Advanced education and relevant civilian experience, along with service policy, determine what grade and time-in-grade are awarded to new-officer entrants. Entering rank depends upon the occupational specialty, educational background, prior experience, and the needs of the military. All of the services require their direct appointments to attend a condensed training program, normally three to five weeks, which provides military orientation and indoctrination [Ref.12].

A comparison of the officer commissioning sources reveals the following facts:
- Service academies are the most costly officer commissioning sources. However academy graduates have the longest commitment for active-duty time, which is five years. For all the other sources the commitment is four years,

- Obligated military service after commissioning is eight years for all commissioning source graduates,

- The average of an academy graduate is four times higher than an ROTC graduate and ten times higher than an OCS/OTS graduate.

Table 3 shows a comparison of officer commissioning sources by duration, benefits and service obligation. Figure 2 is a comparison of accession sources between fiscal years 1980 and 1997.

Table 3.   Comparisons of Accession Sources

Category	Service Academy	ROTC[a]	OCS/OTS[b]	Direct Appointment
Duration	4 years; full-time status	1–4 years, depending on scholarship; part-time status	10–16 weeks, full-time	3–5 weeks, full-time
Benefits	All educational expenses paid $600/month stipend Commission as an officer	Depend on scholarship type Commission as an officer	Paid training Commission as an officer	Paid training Commission as an officer
Service obligation	8 years total (at least 5 years' active duty)	8 years total (at least 4 years' active duty if scholarship; 2–3 years if nonscholarship)	8 years total (at least 4 years' active duty)	Depends on specific program
Rank upon graduation	Second Lieutenant/ Ensign (Navy)	Second Lieutenant/ Ensign (Navy)	Second Lieutenant/ Ensign (Navy)	Depends on occupational specialty, constructive credit computation; usually Second Lieutenant-Captain/ Ensign-Lieutenant (Navy)
Federal government cost per graduate[c]	$340,000	$86,000	$32,000	Less than OCS/OTS[d]

Source: Rand (1999, Table 3.4, Page 21)

Figure 2.   DOD Officer Accession Source by Commissioning Source (FY80-FY97)
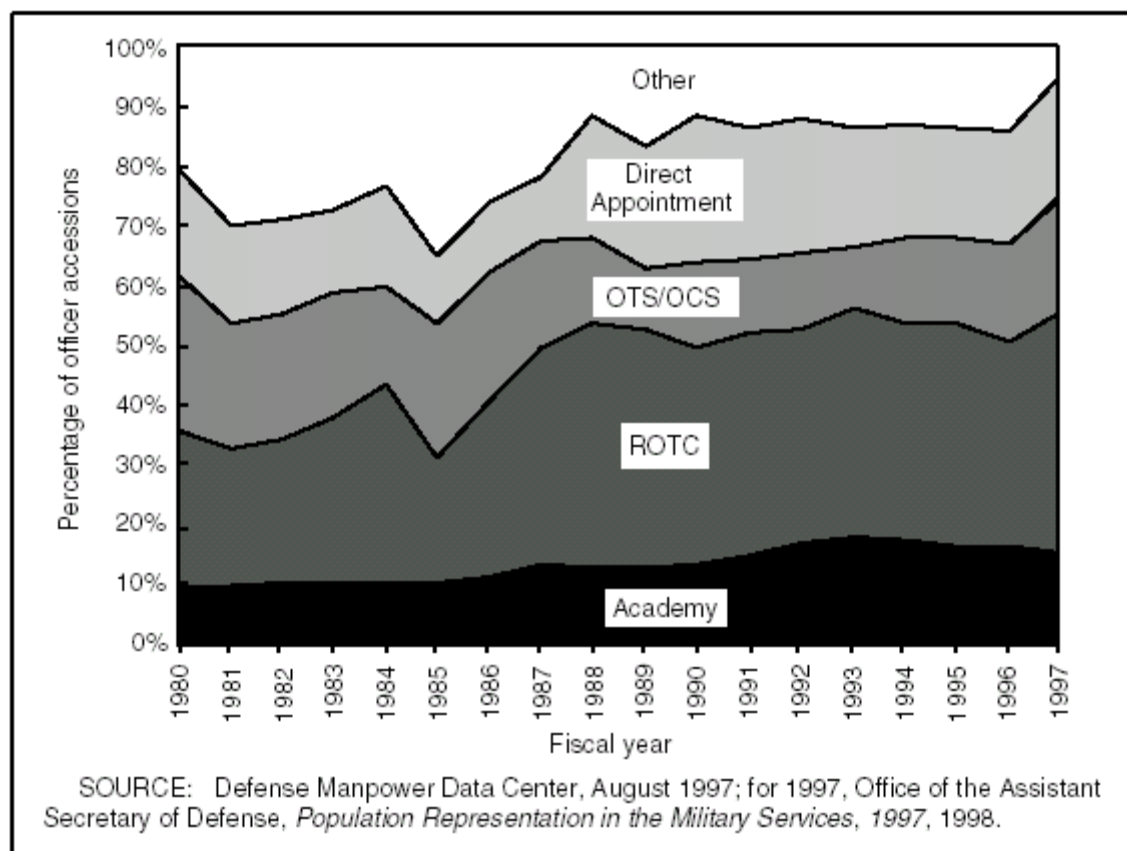
Source: Rand (1999, Figure 3.3, Page 22)

G.   ENLISTED-TO-OFFICER COMMISSIONING PROGRAMS

All three services have unique ways for commissioning enlisted servicemembers as officers in the U.S. military. These commissioning programs help enlisted servicemembers to get ready for OCS/OTS or ROTC programs. Selected individuals have to complete a college education, have a bachelor's degree or at least have some college education prior to enrolling in ROTC or OCS.

1.   ARMY

"The Green to Gold Program" targets qualified young enlisted soldiers who consider leaving active duty to attend college. Enlisted servicemembers with at least two

years of active duty service are allowed to request discharge from active duty. Enlisted soldiers who receive bachelor's degrees in the Army ROTC are commissioned as second lieutenants. The Army's Green to Gold scholarship pays for the tuition, books, supplies and equipment. A $200 stipend for a maximum of ten months each school year is included in the scholarship benefits [Ref.13].

2.   MARINE CORPS

The Marine Corps has four primary programs for enlisted servicemembers. Some of the primary programs are [Ref.15]

- Marine Enlisted Commissioning Education Program (MECEP),
- Broadened Opportunity for Officer Selection and Training (BOOST),
- Meritorious Commissioning Program (MCP),
- Enlisted Commissioning Program (ECP).

Qualified active duty marines and marines in the Active Reserve (AR) program may join the Marine Enlisted Commissioning Education Program (MECEP). Upon successful completion of MECEP, marines receive a bachelor's degree and are commissioned as second lieutenants in the United States Marine Corps Reserve.

The Broadened Opportunity for Officer Selection and Training (BOOST) helps applicants prepare for a commissioning program. These programs include the U.S. Naval Academy, the Marine Corps Enlisted Commissioning Education Program (MECEP), and the Marine Option Naval Reserve Officer Training Corps Scholarship program (NROTC). BOOST is a 10-month academic improvement course. Figure 3 shows the enlisted commissioning opportunities that are unique to the Marine Corps.

Figure 3.   Enlisted Commissioning Opportunities in the Marine Corps
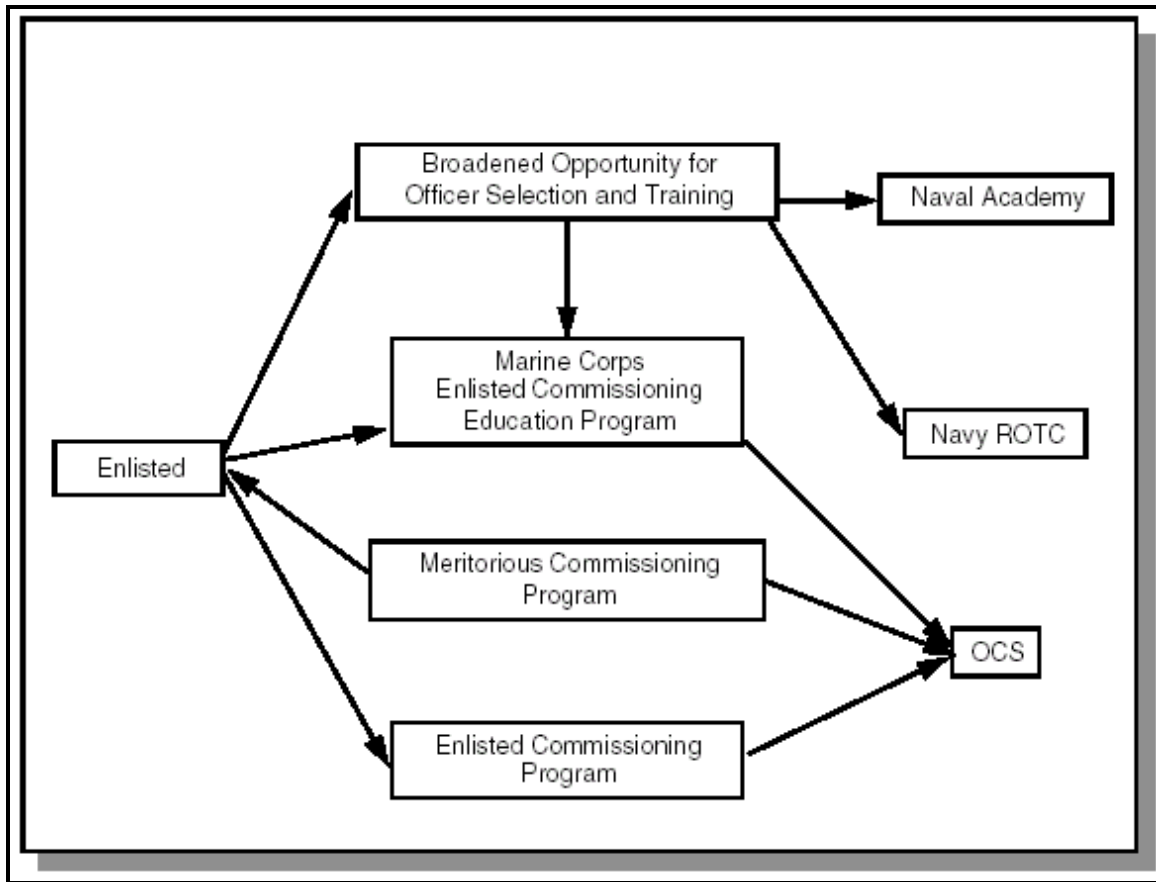
Source: Rand (1999, Figure 3.6, Page 28)

3.   NAVY

Until recently the Navy had a dozen primary programs for enlisted service members. Some of the primary programs were as follows [Ref.14]:

- Enlisted Commissioning Program (ECP),
- Seaman-to-Admiral Program (STA),
- Broadened Opportunity for Officer Selection and Training (BOOST),
- Aviation Enlisted Commissioning Program (AECP),
- Nuclear Enlisted Commissioning Program (NECP),
- Civil Engineers Corps Enlisted Commissioning Program (CECECP),

These programs had different benefits, requirements, selection procedures, and educational opportunities. The Navy experienced many difficulties in administering this complicated network of commissioning programs. Not long ago, the Navy consolidated most of the current commissioning programs into one program and named it "Seaman to Admiral-21" (STA-21) [Ref.14].

In some of the previous enlisted commissioning programs, sailors had to pay the college tuition or had to leave active duty. The new STA-21 Program allows participants to stay on active duty at their current enlisted pay grade. Additionally, the new STA-21 program pays $10,000 per year for tuition, fees, and books. Sailors must pay any costs above the $10,000 per year.

4. AIR FORCE

The United States Air Force uses five different enlisted-to-officer programs in order to attract qualified enlisted servicemembers into the officer corps. After successful completion of any of these programs, applicants are commissioned as second lieutenant with an active-duty service commitment of at least four years [Ref.16].

These programs are

- The Airman Education and Commissioning Program (AECP),
- BOOTSTRAP,
- Airman Scholarship and Commissioning Program (ASCP),
- Scholarship for Outstanding Airman to ROTC Program (SOAR),
- Professional Officer Course-Early Release Program (POC-ERP).

Applicants selected for AECP go to school just like full-time college students. Participants are administratively assigned to an Air Force ROTC detachment and are allowed to remain on active duty. Depending on the major and prior academic preparation of the applicants, AECP may last for one to three years. Upon graduation, AECP cadets go to Officer Training School (OTS).

Unlike the Airman Education and Commissioning Program (AECP), the Airman Scholarship and Commissioning Program (ASCP), Scholarship for Outstanding Airman

to ROTC Program (SOAR) and Professional Officer Course-Early Release Program (POC-ERP) participants have to separate from the active-duty Air Force and join an Air Force ROTC program. Except for POC-ERP students, the Air Force provides a scholarship for the tuition and fees (up to $15,000 per year), a $510 annual book allowance, and a monthly nontaxable stipend of $200 to $400. Figure 4 shows the enlisted commissioning opportunities that are unique to the Marine Corps.

Figure 4.   Enlisted Commissioning Opportunities Unique to the Air Force
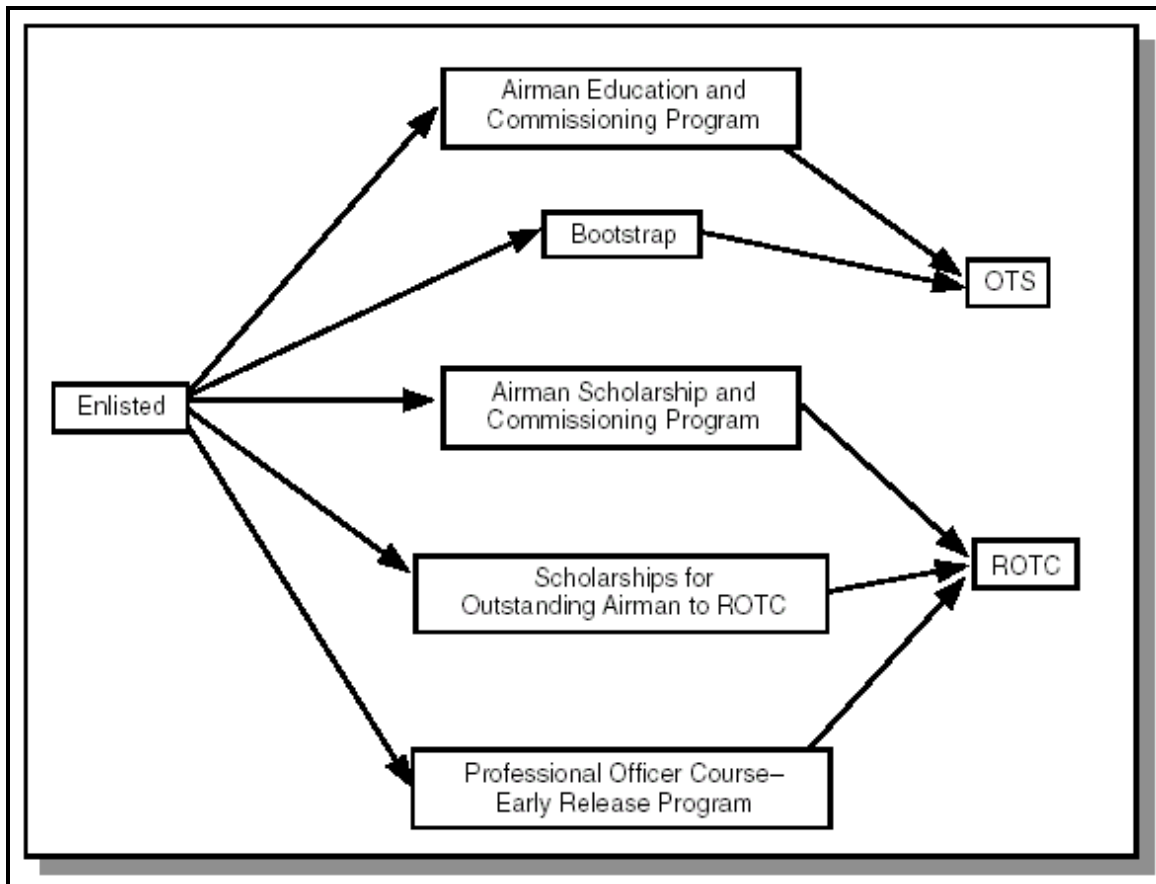
Source: Rand (1999, Figure 3.5, Page 25)

III. DATA AND METHODOLOGY

This chapter describes the data and the variables used in this study. A discussion of the statistical methodology and model specification used in the analysis is included in this chapter. Also, descriptive statistics and frequencies of the data are presented and discussed in this chapter. This study uses binary logit models to estimate the separation behavior of officers who are at the end of their initial obligated service. Among all the factors that influence an officer's separation decision, commissioning source is the primary focus of this analysis.

A. THE DATA

The Defense Manpower Data Center (DMDC) in Monterey, California, provided the data file used for this analysis. The data file, which contains longitudinal information on officers who entered the services between fiscal years 1985 and 1995, was obtained from the Officer Master File (OMF) database maintained at the DMDC. The Officer Master File is updated annually (on September 30 at the end of the fiscal year) by matching records from the Active Duty Master File with the current OMF. Because new records are placed in the Active Duty Master File (ADMF) monthly, matching provides accurate information on each officer's retention and promotion history.

The original data file provided by DMDC contained 67 variables providing information on 237,848 officers commissioned in the military between fiscal years 1985 and 1995. Records without a valid Social Security Number and Service are not included in the OMF or in the original data file provided by the DMDC. The original data file was screened to eliminate erroneous data. Observations were deleted that had missing data records for any of the 11 explanatory variables used to analyze officer retention. All variables were recoded as binary (dummy) variables. Categories (new variables) with less than one percent of all observations were also deleted because drawing inferences on characteristics with very small sample sizes may be misleading. The recoding process

increased the total number of variables used in the analysis to 36. Table 4 below provides definitions of the 36 analysis variables.

Table 4.   Variable Definitions

Variable	Description
Demographics	
MALE	=1 if officer is male = 0 otherwise
FEMALE	=1 if officer is female = 0 otherwise
SNC	=1 if officer is single and has no children = 0 otherwise
SWC	=1 if officer is single and has children = 0 otherwise
MNC	=1 if officer is married and has no children = 0 otherwise
MWC	=1 if officer is married and has children = 0 otherwise
WHITE_NON_HISPANIC	=1 if officer is White (Non-Hispanic) = 0 otherwise
BLACK_NON_HISPANIC	=1 if officer is Black (Non-Hispanic) = 0 otherwise
HISPANIC	=1 if officer is Hispanic = 0 otherwise
OTHERRACE	=1 if officer is from any other race = 0 otherwise
REGULAR	=1 if officer commissioned in reserves = 0 otherwise
RESERVE	=1 if officer is in the reserve = 0 otherwise
PRIOR_ENLISTED	=1 if officer has prior enlisted service = 0 otherwise
ARMY	=1 if officer is in the army = 0 otherwise
NAVY	=1 if officer is in the navy = 0 otherwise
MARINE	=1 if officer is in the marine corps = 0 otherwise
AIR FORCE	=1 if officer is in the air force = 0 otherwise
Paygrade	
O1	=1 if officer is in paygrade O1 = 0 otherwise
O2_PLUS	=1 if officer is in paygrade O2 or higher = 0 otherwise

Commissioning Source	
ACAD	=1 if officer is graduated from any Military Academy = 0 otherwise
ROTC_NON_SCH	=1 if officer is graduated from an ROTC Non-scholarship program = 0 otherwise
ROTC_SCH	=1 if officer is graduated from an ROTC scholarship program = 0 otherwise
OCS	=1 if officer is graduated from Officer Candidate or Training School = 0 otherwise
APPOINT	=1 if officer is commissioned through direct appointment = 0 otherwise
OTHER_SOURCE	=1 if officer is commissioned through any other source = 0 otherwise
Fiscal year	
FY85	=1 if fiscal year is 1985 = 0 otherwise
FY86	=1 if fiscal year is 1986 = 0 otherwise
FY87	=1 if fiscal year is 1987 = 0 otherwise
FY88	=1 if fiscal year is 1988 = 0 otherwise
FY89	=1 if fiscal year is 1989 = 0 otherwise
FY90	=1 if fiscal year is 1990 = 0 otherwise
FY91	=1 if fiscal year is 1991 = 0 otherwise
FY92	=1 if fiscal year is 1992 = 0 otherwise
Education Level	
UPTOCOLL	=1 if officer's education level is no more than some college = 0 otherwise
COLL	=1 if officer has a college diploma or more = 0 otherwise

B.   COMPUTED MEANS AND DESCRIPTIVE STATISTICS

1.   Age Distribution at Entry Point

Table 5 shows the age distribution of officers at time of commissioning based on the original, unscreened data provided by DMDC. Each service commissions the bulk of its officers between 22 and 26 years of age. The U.S. Marine Corps has the highest percentage of officers commissioned between ages 17 to 21 (36 percent). This likely reflects a high number of prior enlisted officers. Also the U.S. Marine Corps has the lowest percentage of older officers with only 0.21 percent entering between 31 and 35 years of age. The U.S. Air Force has the lowest percentage of officers in the 17-21 year range (14.18 percent).

Table 5.   Officer Age Distribution at Time of Commissioning by Service

Age at Entry	Army	Navy	Marine Corps	Air Force	All Services
17-21	16,330	18,133	6,213	9,267	49,943
%	19.11	31.82	36.02	14.18	22.19
22-26	54,699	31,330	10,437	44,996	141,462
%	63.99	54.98	60.5	68.84	62.85
27-30	8,925	4,552	564	6,334	20,375
%	10.44	7.99	3.27	9.69	9.06
31-35	5,519	2,970	37	4,764	13,290
%	6.46	5.21	0.21	7.29	5.9
Total	85,473	56,985	17,251	65,361	225,070

2.   Means and Frequencies of the Explanatory Variables

Table 6 presents the number of observations (N), means, and standard deviations for the analysis variables. As noted earlier, variables in the original data file are recoded to be used in the binary logit multivariate estimation models. Logit models use certain variables as the "base case." For example SEX, a categorical variable in the original data file was recoded as MALE and FEMALE and MALE was chosen as the base case for the

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analysis of officer retention. Table 28 in Appendix B shows the hypothesized signs for the analysis variables.

Table 6.   Descriptive Statistics for Explanatory Variables

Variable	N		Means		St. Dev.	
Demographics	Original	Screened	Original	Screened	Original	Screened
MALE	220,722	118,392	0.8377	0.8502	0.3686	0.3578
FEMALE	220,722	118,392	0.1622	0.1497	0.3686	0.3578
SNC	202,728	118,392	0.6051	0.6667	0.4888	0.4727
SWC	202,728	118,392	0.0401	0.0396	0.1962	0.2058
MNC	202,728	118,392	0.0347	0.0277	0.1831	0.1656
MWC	202,728	118,392	0.3199	0.2657	0.4664	0.4411
WHITE	219,473	118,392	0.8513	0.8742	0.3557	0.3345
BLACK	219,473	118,392	0.0784	0.0645	0.2688	0.2463
HISPANIC	219,473	118,392	0.0270	0.0241	0.1622	0.155
OTHERRACE	219,473	118,392	0.0431	0.0370	0.2031	0.1931
REGULAR	220,526	118,392	0.2911	0.3314	0.4542	0.4714
RESERVE	220,526	118,392	0.7088	0.6685	0.4542	0.4714
PRIOR_ENLISTED	220,753	118,392	0.0627	0.0548	0.2425	0.2258
NOT_PRIOR_ENLISTED	220,753	118,392	0.9373	0.9452	0.2425	0.2258
ARMY	220,753	118,392	0.3738	0.2600	0.4838	0.4401
NAVY	220,753	118,392	0.255	0.2454	0.4358	0.4299
MARINE	220,753	118,392	0.076	0.0851	0.265	0.2799
AIR FORCE	220,753	118,392	0.295	0.4092	0.456	0.4912
Paygrade						
O1	220,738	118,391	0.7612	0.8717	0.7612	0.3361
O2_PLUS	220,738	118,391	0.1546[*]	0.1282	0.1902	0.3361
Commissioning Source						
ACAD	196,112	118,392	0.1126	0.1885	0.2303	0.3969
ROTC	196,112	118,392	0.1918	0.2120	0.3937	0.4075
ROTC_SCH	196,112	118,392	0.1883	0.2216	0.3909	0.4169
OCS	196,112	118,392	0.1925	0.2119	0.3942	0.4029
APPOINT	196,112	118,392	0.1969	0.1548	0.3268	0.3614
OTHER_SOURCE	196,112	118,392	0.0216[**]	0.0110	0.1454	0.1045
Education Level						
UPTOCOLL	171,960	118,392	0.0597	0.0151	0.237	0.1238
COLL	171,960	118,392	0.9394	0.9848	0.2384	0.1239

* 8.42 % of the cases belong to warrant officers who are not used in the analysis.
** 9.63 % of the cases belong to commissioning sources that are not used in the analysis.

The base case variables in this analysis are: MALE, SNC (Single No Children), WHITE, REGULAR, NO_PREVIOUS_SERVICE, ARMY, O1, ROTC, and COLL. The analysis compares all officers to the reference case of a white, single, male, college

graduate officer with no children, and in paygrade O1, having no prior enlisted service in the military and entering the Army with a regular commission.

An examination of the descriptive statistics (based on the screened data file) reveals the following insights:

1. Almost every officer in the data file has at least a bachelor's degree. Table 6 shows that 98.48% of all officers had bachelor's or advanced degrees at the time of commissioning,
2. The majority of officers (43.36%) entered the services via ROTC scholarship or non-scholarship programs. Direct appointments and OCS together supplied almost as many officers as ROTC programs (36.67%). Service Academies account for the remaining 18.85%,
3. Most of the officers entered the services in paygrade O1 (87.17%), as expected. Individuals who entered the services in paygrade O2 or higher via direct appointment programs, OCS/OTS or ROTC programs constitute the remaining 13%,
4. The majority of officers were white (87.42%), single with no children (66.67), and male (85.02 %). Single category includes individuals who were never married or separated prior to commissioning as an officer.
5. The average entry age for all officers was 22.35.

Tables 29 through 36 in Appendix B present the number of observations and frequencies for the explanatory variables for both the original and screened data files. Frequency analysis shows that screening for errors decreases the size of data file by 50.22 percent.

Table 7 shows the effect of various deletions on the size of the data file. SAS logit estimation models do not use observations with an unknown value for any of the explanatory variables. Therefore, cases with an unknown variable in any of the explanatory variables were deleted from the data file prior to the analysis. The largest effect comes from the deletion of the unknown fields for the "education" variable. Screening for education decreases the size of the data file by more than 22%. Fiscal years 1993, 1994 and 1995 are also deleted due to the seven-year time frame used in this analysis. Analysis of officers entering the military in 1993, 1994 and 1995 will be misleading because there is not enough time to study their retention behavior. Deletion of fiscal years 1993, 1994 and 1995 decreases the size of the data file by almost 15%. Finally, deletion of the unknown cases for "commissioning source" decreases the size of the data file by 12%.

Table 7 does not follow an order in the screening of variables for error. The first 12 items in the table show the effect of screening for the unknown category. Remaining items show screening for the "focus" variables of the study, such as deletion of warrant officers or deletion of cases with a very small sample size (usually less than 1%). Also, ratios in Table 7 are proportional to the overall file size, not to the file size screened for any item earlier. Because some of the observations have an unknown field in more than one variable and/or fall into the category of screening for other reasons, the total number of deleted observations is smaller than the sum of all deleted items in Table 7.

Table 7.   Screening Effect on the Original File Size

Order	Deletion	Number of Cases Deleted	Ratio to Original Data File	File size after Deletion
1	None			237,848
2	Unknown cases for Component	334	0.14%	237,514
3	Unknown cases for Marital Status	10,125	4.26%	227,723
4	Unknown cases for Number of Dep.	17,347	7.29%	220,501
5	Unknown cases for Source of Comm.	27,883	11.72%	209,965
6	Unknown cases for Education	54,392	22.87%	183,456
7	Unknown cases for Sex	94	0.04%	237,754
8	Unknown cases for Paygrade	33	0.01%	237,815
9	Unknown cases for Race Ethnic	2,523	1.06%	235,325
10	Unknown cases for Service	0	0.00%	237,848
11	Unknown cases for Fiscal Year	0	0.00%	237,848
12	Unknown cases for Prior Enlisted	0	0.00%	237,848
13	Temporary Component	151	0.06%	237,697
14	Guard Component	466	0.20%	237,382
16	Merchant Marine Academy	23	0.01%	237,825
17	ANG Academy	11	0.00%	237,837
18	Aviation Cadet	374	0.16%	237,474
19	Direct App. Warrant Officer	3,143	1.32%	234,705
20	Direct App. Comm. Warrant Officer	2,524	1.06%	235,324
22	Warrant Officers	2,240	0.94%	235,608
23	Fiscal Year 1993, 1994 & 1995	52,190	21.94%	185,568
	TOTAL COMBINED DELETIONS	125,809	52.89%	129,168

Table 6 shows that the distribution of characteristics in the screened data file is representative of the original data file. However, some differences exist in the representation of each service in the screened file. The most significant change is the 11% increase in the representation of the Air Force (from 29.50% to 40.92%) and 11%

decrease in that of the Army (from 37.38% to 26.00%). The other changes are a 6% increase in the size of SNC and a 5% decrease in the size of MWC.

C.   CROSS TABULATION ANALYSIS AND SUMMARY STATISTICS

Relationships between the 11 variables used in this study help understand the data better. For this reason, cross tabulations are used to examine the relationships between several variables. Selected variables for cross tabulation analysis include education, commissioning source, service, prior enlisted service, occupation, paygrade, sex, race and fiscal year. Tables 37 through 56 in Appendix B present the cross tabulation results for the unscreened data file.

1.   Cross-Tabulation of Service by Education

Table 37 in Appendix B presents the cross tabulation results for service and education. While the Marine Corps has the highest percentage of officers with only an associate's degree (17%), the Air Force is the best-educated service of the sample; 79% of the Air Force officers have bachelor's degrees and 13% have advanced degrees. Only one percent of the Air Force officers have associate degrees. The Marine Corps are the second best educated service of the sample with 73% bachelor's degree. Percentage of officers with bachelor's degrees for the Army and the Navy are 55% and 57%, respectively.

2.   Cross-Tabulation of Education by Source of Commissioning

Tables 38 and 39 in Appendix B present the cross tabulation results for education and commissioning source. Naturally, graduates of any military academy or ROTC program (scholarship or non-scholarship) must have at least college degrees. However, in the data file the ratio of officers with a college diploma ranges from 82% for the ROTC non-scholarship category to 99% for the Naval Academy graduates. The reason for not having 100% is the large number of observations with unknown data. For ROTC non-scholarships the percentage of unknown cases is as high as 14%. Also, most of the officers coming through professional direct appointment programs have doctorate degrees (54%). For non-professional direct appointments the ratio is 17%.

3. Cross-Tabulation of Prior Enlisted Service by Service and Occupation

Tables 40 through 43 in Appendix B present the cross tabulation results for prior enlisted service and occupation. Navy has the highest ratio of officers who are prior enlisted servicemembers. 41% of 14,450 officers with prior enlisted service are in the Navy. Only 2% of the prior enlisted officers are in the Army. Academies have very small numbers of prior enlisted servicemembers (almost 0%). 16% of officers commissioned through OCS/OTS are prior enlisted servicemembers. Also, 10% of non-professional-direct appointment officers are prior enlisted servicemembers.

4. Cross-Tabulation of Commissioning Source by Sex

Table 45 through 48 in Appendix B present the cross tabulation results for commissioning source and sex. Non-professional direct appointment programs provide the largest number and percentage of female officers in the Air Force (59%) and Navy (28%). 12% of all officers commissioned through the USAF, ROTC scholarship and non-scholarship are female. In the Army the majority of female officers are commissioned through ROTC non-scholarships (3,517). Females are 20% of ROTC scholarship graduates.

5. Cross-Tabulation of Commissioning Source by Race_Ethnic

Tables 49 through 56 in Appendix B present the cross tabulation results for commissioning source and race. In the Air Force, Aviation cadet programs have the largest percentage of Black officers. 8% of officers commissioned through non-professional direct appointment programs are Black. In the Army 15% of ROTC non-scholarship graduates are Black and 4% are Hispanic. Also, 13% of Aviation Cadet program graduates are Black. In the Navy, the majority of Black officers enter the service via OCS (842) and ROTC scholarship programs.

D. METHODOLOGY

As previously noted, the data file contains records for all officers who were commissioned between 1985 and 1995. Only officers without a valid coding for their social security number and service are excluded from the original data file. The cutoff

point to analyze retention is six or seven years for all officers except for pilots. Because of the higher education and training costs, pilots generally incur eight to ten years of obligated service. Therefore, nine years are considered to be an appropriate cutoff point for the pilots in all services.

Although every academy graduate incurs a five-year service obligation, using a constant minimum service requirement for officers coming from the other sources is quite difficult. For example, an ROTC graduate may incur a minimum of two to four years in active duty, depending on the scholarship type or the service. Likewise, the minimum service requirement for direct appointment commissionees differs by the length of contract and the service or the community.

The dependent variable, STAY, is computed by following every individual from the time of commissioning until the six-year cutoff point for non-academy officers. This provided a two-year "window" to observe the retention decision. Academy graduates were given seven-year cutoff to provide a similar two-year window for their stay-leave decision. Each individual who was still in the service beyond the six-year or seven-year cutoff point was considered a "stayer." Likewise, any individual who was separated prior to the six-year or seven-year cutoff point was considered a "leaver." Length of service for stayers and leavers was computed using two different variables. The OMF follows every officer from the time of entry into the military until the last time the officer was recorded in the data file. As previously noted the OMF is updated annually. Officers who were not recorded in a particular year were placed in the loss section of the data file at that year. Variable FISCAL_YEAR_OF_MATCH_LOSS was used to record officers who left the military. Likewise, variable FISCAL_YEAR_OF_MATCH_1 is used to keep a record of officers who were still in the military in year 2000. Length of service equals the value of fiscal year (gain variable) subtracted from the match year (FISCAL_YEAR_OF_MATCH_1 for stayers and FISCAL_YEAR_OF_MATCH_LOSS for leavers). The mathematical representation of this calculation is as follows:

LOS = FY - FISCAL_YEAR_OF_MATCH_1 (For stayers)
LOS = FY - FISCAL_YEAR_OF_MATCH_LOSS (For leavers)

1. The Theoretical Model

The theoretical assumption of this thesis is that several factors, such as personal demographics, military background (service and community), education level, academic achievement and commissioning source, affect an officer's decision on whether to leave the service or not. Figure 5 shows the various factors that are assumed to affect the voluntary stay-leave decision.

Figure 5.   Theoretical Model
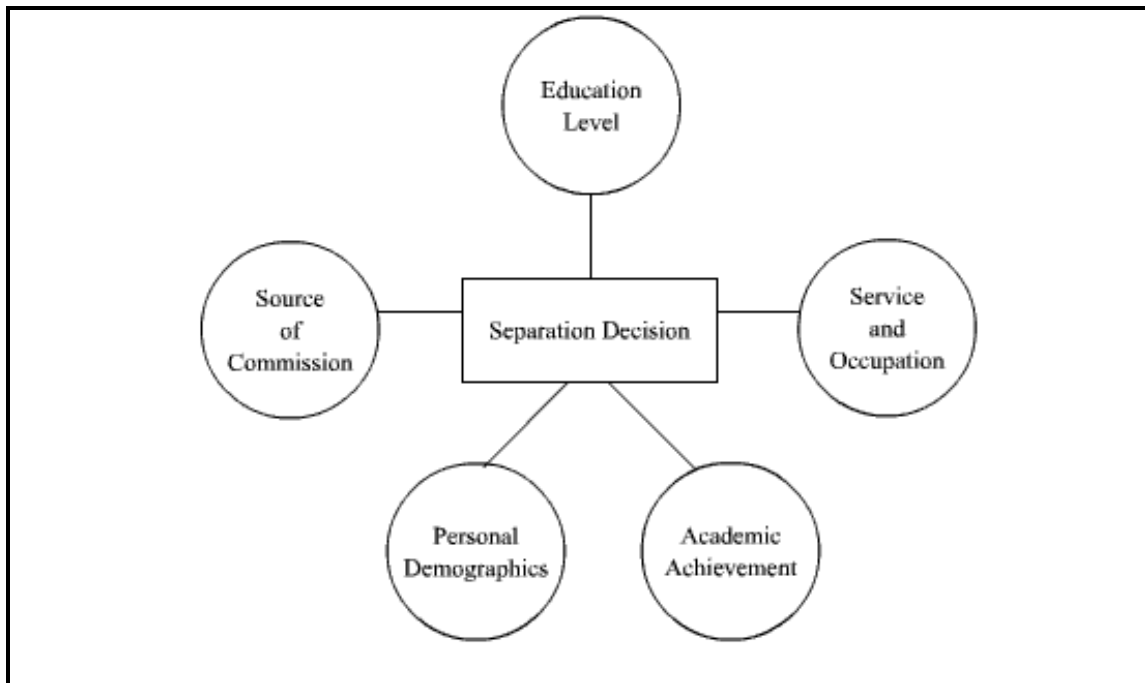
2. The Retention Model

The dependent variable of this study, STAY, is a dichotomous variable that takes values 1 or 0 corresponding to staying in or leaving the military. The dependent variable takes on a value of "0" for an officer who was separated from the service prior to completing the minimum service requirement (during the two-year window) and a value of "1" for an officer who remained in the service beyond the minimum service requirement (including the two-year window). For this analysis the data was modeled using a logit model.

The specifications of the retention model are as follows:

STAY = *f* (FEMALE, SWC, MNC, MWC, BLACK_NON_HISPANIC, HISPANIC, OTHERRACE, RESERVE, NAVY, MARINE, AIRFORCE, ACAD, ROTC, OCS, APPOINT, OTHER_SOURCE, COLL)

a. *Why Use a Logit Model?*

OLS (Ordinary Least Squares) estimation technique is not the best estimator for regression models with binary (dichotomous) dependent variables. Applying OLS to models with binary dependent variables may generate probabilities (predictions of the dependent variable) outside the boundary of 0 and 1. For example, using OLS to predict the probability of an officer staying in the service may result in a predicted probability of 1.8 or -0.7, both of which are meaningless.

Logit models can be used to predict the dependent variables with only two possible outcomes (1 or 0). A binomial logit model prevents the dependent variable from taking values smaller than 0 and larger than 1. Regression type models with a logit (natural logarithm of the odds of a successful outcome) variable at the left-hand-side of the equation are referred to as "logit model."

Figure 6 shows that the probability ("P") or expected value of "Y" (the dependent variable) will equal 1 given the set of independent variables (X_{1i}, X_{2i}). In this study "P" is the probability of an officer staying in the service past the minimum service requirement. Figure 6 also shows that the dependent variable is bounded by 1 and 0.

Figure 6.   Logit Models

$$\hat{P} = \frac{1}{1 + e^{\beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + e_i}}$$

$$P_i = E\,[Y \mid X_{1i}, X_{2i}]$$
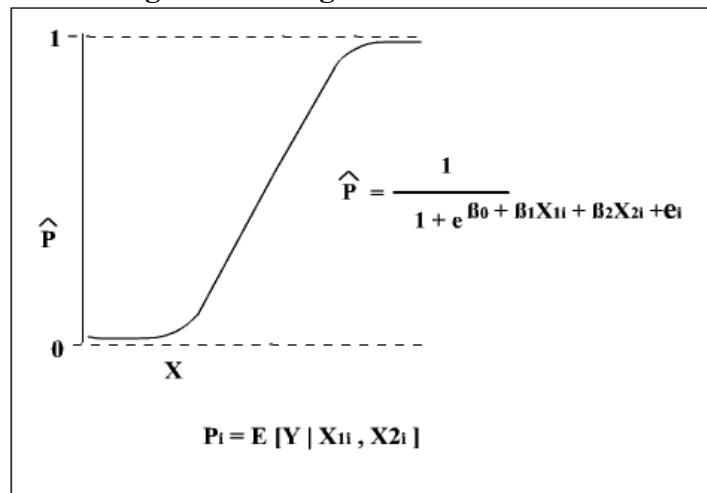
IV. RESULTS

This chapter is divided into five sections. The first four sections discuss the results of the binomial logit models used in the analysis of officer retention. The fifth section uses cross tabulations to profile the "minimum service requirement (MSR)" retention rates for all services by sex, paygrade, service, primary occupation, commissioning source, race, and fiscal year. As stated earlier, the primary objective of this study is to examine the effect of commissioning source on officer retention at the end of initial obligated service. This study uses ten separate models to address the primary and secondary research questions. Five retention models are estimated at the all-DOD level and four retention models are estimated for each individual service. The focus of the first five models is retention at the end of the minimum service requirement. The second set of five models examines retention at the ten-year point.

In the first five retention models, six- seven- and nine-year cutoff points were used to observe retention decisions and capture the effects of different obligation periods across commissioning programs. As previously noted, using a constant minimum service requirement for officers coming from accession programs other than the service academies is quite difficult. The minimum service requirement for every officer differs by source of commission, the type of scholarship (if any), the length of contract, and the service or the community.

First commitment obligations were calculated by adding two years to the minimum service requirements (MSR) of each commissioning source. Calculation of first commitment periods resulted in a six-year window for ROTC and OCS/OTS graduates and a seven-year window for academy graduates. Because of the higher education and training costs, pilots generally incur eight to ten years of initial obligated service. Therefore, nine years are considered to be an appropriate cutoff point for pilots in all services.

A. MSR RETENTION MODEL RESULTS (DOD)

Table 8 displays the maximum likelihood estimates, standard errors, significance levels and partial effects of the logit model for all variables used in the analysis of retention of officers who are at the end of initial commitment.

Table 8. **Minimum Service Requirement Retention Logit Model for All Services [a]**

VARIABLES	ESTIMATE	STD. ERROR	PARTIAL EFFECT
Intercept	0.0819	0.0283	0.52045
Reserve	-0.3144*	0.0212	-0.0783
O2_plus	-0.3810*	0.0243	-0.0946
Female	-0.4506*	0.0179	-0.1116
Black_Non_Hispanic	0.0620**	0.0250	0.0154
Hispanic	-0.1125*	0.0392	-0.0281
Other_Race	0.0036	0.0322	0.0009
SWC	0.1261*	0.0336	0.0313
MNC	0.1205*	0.0376	0.0299
MWC	0.3134*	0.0156	0.0771
Up_to_College	0.2437*	0.0512	0.0602
Academy	-0.0650*	0.0225	-0.0162
ROTC_Non_Scholarship	0.2827*	0.0203	0.0697
OCS	0.0904*	0.0223	0.0225
Appointment	-0.0832*	0.0266	-0.0207
Other_source	0.0322	0.0638	0.0080
Prior_Enlisted	0.2214*	0.0313	0.0547
Navy	0.3476*	0.0188	0.0853
Marine	0.0956*	0.0274	0.0238
AirForce	0.7922*	0.0162	0.1851
- 2 Log L = 159,579 Pr>ChiSq = <. 0001	N = 118,392 DF = 26 R_p^2=60.9		Pred.Prob. =0.52045

*** = Significant at 10%
** = Significant at 5%
* = Significant at 1%
[a] All retention models contain fiscal year (FY) dummy variables that are not shown in the tables.

1. Measuring Goodness of Fit

Table 8 also includes the "Model Fit Statistics." Model Chi_Square (- 2 Log Likelihood), Percent Correct Predictions (R_p^2) and Pseudo-R^2, which are statistics used to compare different models and to evaluate the goodness of fit of a logit model.

The "maximum likelihood estimation" technique maximizes the log of the likelihood function. The MLE technique finds the set of coefficients that minimizes -2

Log L (– 2 times the Log of the Likelihood function). The Model Chi_Square (–2 Log L) statistic is used to determine if the overall model is statistically significant. The model in Table 8 has a log likelihood ratio of 159,579 with 26 degrees of freedom and a probability value of < .0001. Therefore, it can be concluded that the null hypothesis that the coefficients of all the analysis variables in the model are zero is rejected.

Percent correct predictions (R_p^2) is the ratio of correctly predicted observations to the total observations in the sample. R_p^2 is computed by using responses to a binary choice data. In this model responses, which are also called events and non-events, are the "stay" and "leave" decisions. Logit analysis models the probability of the event by using some cut-point level. Observations with predicted event probabilities exceeding the cut-point value are assumed to be event observations, otherwise non-event observations. This model predicts 60.9% of the events (stayers) and non-events (leavers) correctly using a 0.52 cut-off level. The overall stay rate of the sample is 59.76%.[4]

2. Interpretation of the Estimated Coefficients

The signs of all coefficients are as hypothesized except for HISPANIC. Among 19 analysis variables, only OTHER_RACE and OTHER_SOURCE are not significant at any accepted significance level (1%, 5%, or 10%). BLACK_NON_HISPANIC is significant at the 5% level. All other explanatory variables are significant at the 1% level. The regression prediction equation derived from Table 8 is as follows:

$$L_i = 0.0819 - 0.3144X_1 - 0.3810X_2 - 0.4506X_3 - 0.0620X_4 + \ldots\ldots + 0.7922X_{27}$$

$X_1 - X_{27}$ represents the variables in the equation, L_i represents the predicted log odds of staying in the military beyond the initial commitment. Using the parameter estimates in Table 8 the estimated log odds of p (staying in the military beyond the initial commitment) can be calculated. The effect of a single coefficient in a logit regression can be described as the increase in the "logit" for every one-unit increase in X, with all other variables held constant. Logit coefficients could be interpreted in logit or log odds; odds or ratios of odds; or probabilities. For example:

---

[4] Note by comparison that the predicted probability in Table 4.1 is .5204. This probability is predicted from the logit model for the "reference" person who has mean values of the X's. The partial effects are calculated using the predicted probability of .5204.

- When interpreted in log-odds, $b_1 = -0.3144$ means that for every one unit change in "RESERVE," the predicted log odds decline by -0.3144, holding constant the other 26 independent variables.

- The predicted log of the odds that an officer stays in the military beyond the initial commitment versus he/she leaves are 0.0819 when that officer is a white, single, male, college graduate with no children and in paygrade O1, having no prior enlisted service in the military and entering the Army with a regular commission. (Reference case).

- Being FEMALE reduces the log odds that an officer is a stayer by 0.4506.

These interpretations of coefficients indicate the direction of the effects (increase or decrease) and the relative magnitudes, but they are not easy to understand because of the non-linearity of logit equations. An alternative way is to calculate the partial effect of each variable on the probability of staying.

3. Calculation of Partial Effects

Measuring the effects of a unit change in each X on the probability that an officer is a "stayer" provides an easier way to interpret the estimated parameters. However, to do so a reference point for calculating the effects of unit changes in X must be chosen. Usually, the reference point is a person who has the sample mean values for all analysis variables. By putting the sample mean values into the regression equation, the predicted log odds that an officer is a stayer can be calculated. The following calculation gives the predicted probability for each coefficient:

$$P = 1 / (1 + e^{-L})$$

For example, the partial effect of being an OCS graduate can be calculated as follows:

$$L_{OCS} = 0.0819 + 0.0904 X_{OCS} + \sum b_i X_i$$

$$L_{OCS} = 0.0819 + 0.0904 (1) + (0) \implies L_{OCS} = 0.1723$$

$$\text{Partial}_{(OCS)} = 1/(1+e^{-.1723}) - 1/(1+e^{-.0819})$$

$$\text{Partial}_{(OCS)} = .496517 - .520463 \implies \text{Partial}_{(OCS)} = .0225$$

The partial effect of .0225 for OCS is entered in the last column in Table 8.

The model in Table 8 contains 19 analysis variables. Eight fiscal year cohort dummy variables are used in the analysis in order to control for the effects of outside factors such as personnel policy changes in the military, the effects of the economy, or military incentives such as pay and benefits.

RESERVE: Officers who receive reserve commmissions are 7.83% less likely to stay in the military beyond MSR than an officer with the base case characteristics, holding every other variable constant.

FEMALE: Female officers are 11.16% less likely to stay in the military beyond MSR than an officer with the base case characteristics, holding every other variable constant.

BLACK: Black officers are 1.54% more likely to stay in the military beyond MSR than an officer with the base case characteristics, holding every other variable constant.

ROTC: ROTC non-scholarship graduates are 6.97% more likely to stay in the military beyond MSR than an officer with the base case characteristics, holding every other variable constant.

With respect to commissioning source, academy graduates are less likely to stay beyond minimum service requirement (MSR), compared to ROTC scholarship graduates. On the other hand, ROTC non-scholarship and OCS graduates are more likely to stay than ROTC scholarship graduates.

B. TEN-YEAR RETENTION MODEL RESULTS (DOD)

Table 9 displays the maximum likelihood estimates, standard errors, significance levels and partial effects of the logit model of retention of officers to the ten-year point. HISPANIC, OTHER_RACE and APPOINTMENT are not significant at any accepted significance level. PRIOR_ENLISTED and ACADEMY are significant at the 5% level. OTHER_SOURCE is significant at the 10% level. The remaining variables are all significant at the 1% level. The ten-year retention model has more unexpected signs than the MSR retention model. HISPANIC, OTHER_RACE, OCS, PRIOR_ENLISTED, NAVY, and MARINE coefficients all have signs opposite to the hypothesized signs.

However, HISPANIC, OTHER_RACE and PRIOR_ENLISTED are not statistically significant. Multicollinearity might be a reason for the unexpected signs. Also, omitted variables and high levels of correlation between variables might cause the unexpected signs.

Table 9.   Ten-Year Retention Logit Model for All Services

VARIABLES	ESTIMATE	STD. ERROR	PARTIAL EFFECT
Intercept	-0.5773	0.0340	0.35955
Reserve	-0.1920*	0.0274	-0.0429
O2_plus	-0.5399*	0.0323	-0.1130
Female	-0.4393*	0.0240	-0.0939
Black_Non_Hispanic	0.1695*	0.0309	0.0399
Hispanic	-0.0001	0.0496	-0.0004
Other_Race	-0.0197	0.0416	-0.0045
SWC	0.3192*	0.0578	0.0763
MNC	0.2293*	0.0480	0.0543
MWC	0.3403*	0.0185	0.0815
Up_to_College	0.2402*	0.0668	0.0570
Academy	0.0733**	0.0290	0.0171
ROTC_Non_Scholarship	0.0861*	0.0251	0.0201
OCS	-0.0811*	0.0266	-0.0184
Appointment	-0.0141	0.0339	-0.0032
Other_source	-0.1370***	0.0767	-0.0309
Prior_Enlisted	-0.0827**	0.0337	-0.0188
Navy	-0.0959*	0.0247	-0.0218
Marine	-0.0987*	0.0358	-0.0224
AirForce	0.3269*	0.0202	-0.0429
- 2 Log L = 103,938 Pr>ChiSq = <. 0001	N = 77,718 DF = 23 R_p^2=62.1		Pred.Prob. =0.35955

*** = Significant at 10%
** = Significant at 5%
* = Significant at 1%

The log likelihood ratio of the ten-year retention model is 103,938 with 23 degrees of freedom and a probability value of < .0001. Therefore, it can be concluded that the analysis variables are statistically significant and explain the variation in the dependent variable. R_p^2 equals 62.1: The model predicts 62.1% of the events (stayers) and non-events (leavers) correctly.

For the ten-year retention model, Academy and ROTC non-scholarship graduates are more likely to stay beyond MSR than ROTC scholarship graduates (1.71% and 2.01

%). By comparison, academy graduates were less likely to stay past MSR in Table 8. ROTC non-scholarship graduates had higher retention at both decision points. OCS graduates and direct appointment commissionees are less likely to stay past the ten year point than ROTC scholarship graduates.

C. MSR RETENTION MODEL RESULTS (INDIVIDUAL SERVICES)

This section discusses the expected signs, significance levels and partial effects of the commissioning source variables in the MSR retention models. Tables 10 through 13 present the maximum likelihood estimates, standard errors, significance levels and partial effects of the logit models for all variables used in the analysis of retention of officers at individual service level.

Several variables are highly correlated such as APPOINTMENT and O2_PLUS; OCS and RESERVE; ACADEMY and RESERVE. Naturally, officers entering the services through direct appointments are older. These officers are professionals (doctors, chaplains, etc.) who join the military at higher ranks. Also, in some models variables such as OTHER_SOURCE, UP_TO_COLLEGE, SWC, MNC or PRIOR_ENLISTED have very few observations. Even though they are significant and have the expected coefficient signs, standard deviations of these variables are large. However, these variables are hypothesized to be important and kept in the model in spite of their small sample sizes in order to maintain a standard level analysis among services.

1. ARMY

Table 10 presents the MSR logit analysis results for the Army. For the Army MSR model, all commissioning source variables are significant at the 1% level. All of the commissioning source variables have the expected signs, except for "appointment." Compared to ROTC_scholarship graduates direct appointment commissionees, ROTC non-scholarship and OCS graduates are more likely to stay in the military beyond minimum service requirement. Academy graduates are less likely to stay in the military beyond MSR compared to ROTC scholarship graduates.

Table 10.   MSR Logit Retention Model for the Army

VARIABLES	ESTIMATE	STD. ERROR	PARTIAL
Intercept	0.0613	0.0602	0.51533
Reserve	-0.2250*	0.0370	-0.0561
O2_plus	0.0451	0.0406	0.0112
Female	-0.4893*	0.0334	-0.1207
Black_Non_Hispanic	0.1938*	0.0390	0.0481
Hispanic	-0.0641	0.0790	-0.0160
Otherrace	0.0764	0.0627	0.0190
SWC	0.1012	0.0643	0.0252
MNC	0.1164***	0.0628	0.0289
MWC	0.1772*	0.0308	0.0440
Up_to_College	0.3155*	0.1032	0.0777
Academy	-0.4363*	0.0499	-0.1079
ROTC_Non_Scholarship	0.2625*	0.0362	0.0649
OCS	0.2226*	0.0698	0.0551
Appointment	0.4227*	0.0514	0.1033
Prior_Enlisted	0.0237	0.5303	0.0059
- 2 Log L = 42,675 Pr>ChiSq = <. 0001	N = 30,786 DF = 22 $R_p^2 = 57.6$		Pred.Prob. =0.51533

***   = Significant at 10%
**   = Significant at 5%
*   = Significant at 1%

The Army model has a log likelihood ratio of 42,675 with 22 degrees of freedom and a probability value of < .0001. Therefore, it can be concluded that the null hypothesis that the coefficients of all the analysis variables in the model are zero is rejected. R_p^2 equals 57.6: The model predicts 57.6% of the events (stayers) and non-events (leavers) correctly

2.   NAVY

Table 11 presents the MSR logit results for the Navy. Among the four commissioning source variables only "appointment" is significant at the 1% level, but it has an unexpected sign. All of the remaining commissioning source variables are insignificant. Compared to ROTC_scholarship graduates, direct appointment commissionees are more likely to stay in the military beyond minimum service requirement.

Navy model has a log likelihood ratio of 39,318 with 22 degrees of freedom and a probability value of < .0001. Therefore, it can be concluded that the null hypothesis that

the coefficients of all the analysis variables in the model are zero is rejected. R_p^2 equals 59.8: The model predicts 59.8% of the events (stayers) and non-events (leavers) correctly

Table 11.   MSR Logit Retention Model for the Navy

VARIABLE	ESTIMATE	STD. ERROR	PARTIAL
Intercept	0.4569	0.0456	0.6122
Reserve	-0.2349*	0.0494	-0.0570
O2_plus	-0.7478*	0.0605	-0.1845
Female	-0.1461*	0.0404	-0.0352
Black_Non_Hispanic	0.0156	0.0575	0.0037
Hispanic	-0.1348**	0.0654	-0.0324
Otherrace	-0.1080***	0.0637	-0.0259
SWC	0.2019	0.1365	0.0467
MNC	0.1881	0.1232	0.0436
MWC	0.4103*	0.0333	0.0918
Up_to_College	0.3867*	0.1120	0.0869
Academy	0.0204	0.0345	0.0053
ROTC_Non_Scholarship	-0.0352	0.0718	-0.0083
OCS	0.0636	0.0530	0.0149
Appointment	0.2124*	0.0664	0.0486
Prior_Enlisted	-0.5742*	0.0722	-0.1415
- 2 Log L = 39,318 Pr>ChiSq = <. 0001	N = 29,064 DF = 22 R_p^2 = 59.8		Pred.Prob. =0.61229

***   = Significant at 10%
**   = Significant at 5%
*   = Significant at 1%

3.   MARINE CORPS

Table 12 presents the MSR logit analysis results for the Marine Corps. For the Marine Corps model, "academy" and "ROTC non-scholarship" are not significant at any accepted significance level. "OCS" and "appointment" are significant at the 1% level; however, they have unexpected signs. Compared to ROTC_scholarship graduates, OCS graduates and direct appointment commissionees are more likely to stay in the military beyond MSR.

The Marine Corps model has a log likelihood ratio of 13,907 with 23 degrees of freedom and a probability value of < .0001. Therefore, it can be concluded that the null hypothesis that the coefficients of all the analysis variables in the model are zero is rejected. R_p^2 equals 61.5: The model predicts 61.5% of the events (stayers) and non-events (leavers) correctly

Table 12. MSR Logit Retention Model for the Marine Corps

VARIABLE	ESTIMATE	STD. ERROR	PARTIAL
Intercept	-0.1099	0.0745	0.4725
Reserve	-1.1896*	0.1334	-0.2583
O2_plus	-1.2136*	0.1167	-0.2623
Female	-0.7084*	0.1174	-0.1664
Black_Non_Hispanic	-0.2896**	0.0927	-0.0711
Hispanic	-0.3119**	0.1119	-0.0764
Otherrace	-0.1410	0.1146	-0.0349
SWC	0.1493	0.2020	0.0373
MNC	0.1436	0.2229	0.0358
MWC	0.4228*	0.0508	0.1050
Up_to_College	0.3107**	0.1125	0.0774
Academy	0.1183	0.0777	0.0295
ROTC_Non_Scholarship	0.1166	0.3976	0.0291
OCS	0.6185*	0.1432	0.1519
Appointment	1.3705*	0.1877	0.3065
Other_source	0.7579*	0.1481	0.1840
Prior_Enlisted	-0.6404*	0.1341	-0.2583
- 2 Log L = 13,907 Pr>ChiSq = <. 0001	N =10,085 DF = 23 $R_p^2 = 61.5$		Pred.Prob. =0.47256

*** = Significant at 10%
** = Significant at 5%
* = Significant at 1%

4. AIR FORCE

Table 13 presents the MSR logit analysis results for the Air Force. For the Air Force MSR model, all commissioning sources except "OCS" are significant at the 1% level; "OCS" is significant at the 5% level. All of the commissioning source variables have the expected signs. Compared to ROTC_scholarship graduates academy, ROTC non-scholarship and OCS graduates are more likely to stay in the military beyond minimum service requirement. Direct appointment commissionees are less likely to stay in the military beyond MSR compared to ROTC scholarship graduates.

The Air Force model has a log likelihood ratio of 61,260 with 22 degrees of freedom and a probability value of < .0001. Therefore, it can be concluded that the null hypothesis that the coefficients of all the analysis variables in the model are zero is rejected. R_p^2 equals 69.2: The model predicts 69.2% of the events (stayers) and non-events (leavers) correctly

Table 13.   MSR Logit Retention Model for the Air Force

VARIABLE	ESTIMATE	STD. ERROR	PARTIAL
Intercept	1.1511	0.0670	0.7597
Reserve	-0.4500*	0.0616	-0.0912
O2_plus	-0.5260*	0.0393	-0.1083
Female	-0.5498*	0.0267	-0.1137
Black_Non_Hispanic	-0.0747	0.0451	-0.0138
Hispanic	-0.1023	0.0775	-0.0191
Otherrace	-0.0926**	0.0522	-0.0173
SWC	-0.0259**	0.0451	-0.0047
MNC	0.1218**	0.0533	0.0215
MWC	0.2146*	0.0247	0.0369
Up_to_College	-0.0070	0.1143	-0.0012
Academy	0.2665*	0.0670	0.0452
ROTC_Non_Scholarship	0.2610*	0.0311	0.0443
OCS	0.1075**	0.0342	0.0190
Appointment	-0.4217*	0.0407	-0.0850
Prior_Enlisted	0.4934*	0.0394	0.0784
- 2 Log L = 61,260 Pr>ChiSq = <. 0001	N = 48,457 DF = 22 $R_p^2 = 69.2$		Pred.Prob. =0.75970

***   = Significant at 10%
**   = Significant at 5%
*   = Significant at 1%

D.   TEN-YEAR RETENTION MODEL RESULTS (INDIVIDUAL SERVICES)

This section discusses the expected signs, significance levels and partial effects of the commissioning source variables in the ten-year retention models. Tables 14 through 17 present the maximum likelihood estimates, standard errors, significance levels and partial effects of the logit models for all variables used in the analysis of retention ten-year of officers at the individual service level.

1.   ARMY

Table 14 presents the ten-year logit analysis results for the Army. Among the four commissioning source variables only "academy" is significant at the 1% level. All of the remaining commissioning source variables are insignificant. Compared to ROTC_scholarship graduates, academy graduates are more likely to stay in the military beyond minimum service requirement.

This model has a log likelihood ratio of 25,257 with 19 degrees of freedom and a probability value of < .0001. Therefore, it can be concluded that the null hypothesis that

the coefficients of all the analysis variables in the model are zero is rejected. R_p^2 equals 62.9: The model predicts 62.9% of the events (stayers) and non-events (leavers) correctly

Table 14.   Ten-Year Retention Model for the Army

VARIABLE	ESTIMATE	STD. ERROR	PARTIAL
Intercept	-0.3695	0.0756	0.4086
Reserve	-0.2158*	0.0501	-0.0509
O2_plus	-0.2672*	0.0513	-0.0626
Female	-0.5710*	0.0459	-0.1278
Black_Non_Hispanic	0.2357*	0.0491	0.0579
Hispanic	-0.0962	0.1084	-0.0230
Otherrace	0.0411	0.0839	0.0099
SWC	0.3351*	0.0937	0.0827
MNC	0.0634	0.0806	0.0154
MWC	0.2058*	0.0398	0.0505
Up_to_College	0.5190*	0.1896	0.1286
Academy	-0.3305*	0.0713	-0.0768
ROTC_Non_Scholarship	0.0471	0.0537	0.0114
OCS	0.0206	0.0879	0.0050
Appointment	-0.0830	0.0715	-0.0198
Prior_Enlisted	0.4490	0.7110	0.1112
- 2 Log L = 25,257 Pr>ChiSq = <. 0001	N = 19,146 DF = 19 $R_p^2 = 62.9$		Pred.Prob. =0.40867

***   = Significant at 10%
**   = Significant at 5%
*   = Significant at 1%

2.   NAVY

Table 15 presents the ten-year logit results for the Navy. In the Navy model "Academy" and "appointment" are significant at the 1% level; "OCS" is significant at the 5% percent level. All of the commissioning source variables have the expected signs, except for "appointment." Compared to ROTC_scholarship graduates academy, ROTC non-scholarship and OCS graduates are more likely to stay in the military beyond minimum service requirement.

The Navy model has a log likelihood ratio of 23,337 with 19 degrees of freedom and a probability value of < .0001. Therefore, it can be concluded that the null hypothesis that the coefficients of all the analysis variables in the model are zero is rejected. R_p^2

equals 65.3: The model predicts 65.3% of the events (stayers) and non-events (leavers) correctly

Table 15.   Ten-Year Retention Model for the Navy

VARIABLE	ESTIMATE	STD. ERROR	PARTIAL
Intercept	-0.6963	0.0501	0.3326
Reserve	-0.1440**	0.0690	-0.0312
O2_plus	-0.7045*	0.0943	-0.1350
Female	0.1731*	0.0582	0.0395
Black_Non_Hispanic	0.2323*	0.0786	0.0534
Hispanic	0.0869	0.0887	0.0196
Otherrace	-0.0374	0.0919	-0.0082
SWC	0.3947***	0.2232	0.0925
MNC	0.3021***	0.1645	0.0701
MWC	0.4663*	0.0421	0.1101
Up_to_College	0.3185**	0.1518	0.0740
Academy	0.2411*	0.0463	0.0555
ROTC_Non_Scholarship	0.1520	0.1003	0.0346
OCS	0.1603**	0.0724	0.0365
Appointment	0.4188*	0.0964	0.0984
Prior_Enlisted	-0.9182*	0.1067	-0.1667
- 2 Log L = 23,337 Pr>ChiSq = <. 0001	N =18,036 DF = 19 R_p^2 = 65.3		Pred.Prob. =0.33263

*** = Significant at 10%
** = Significant at 5%
* = Significant at 1%

3.   MARINE CORPS

Table 16 presents the ten-year logit analysis results for the Marine Corps. For the Marine Corps model, "ROTC non-scholarship," "OCS" and "other_source" are not significant at any accepted significance level. "Academy" is significant at the 10% level. "Appointment" is significant at the 1% level. Except for "appointment" all commissioning source variables have the expected signs. Compared to ROTC_scholarship graduates direct appointment commissionees and academy graduates are more likely to stay in the military beyond MSR.

The Marine Corps model has a log likelihood ratio of 8,459 with 20 degrees of freedom and a probability value of < .0001. Therefore, it can be concluded that the null hypothesis that the coefficients of all the analysis variables in the model are zero is

rejected. R_p^2 equals 67.1: The model predicts 67.1% of the events (stayers) and non-events (leavers) correctly

Table 16.   Ten-Year Retention Model for the Marine Corps

VARIABLE	ESTIMATE	STD. ERROR	PARTIAL
Intercept	-0.4802	0.0852	0.3822
Reserve	-0.9277*	0.2495	-0.1856
O2_plus	-1.2030*	0.1919	-0.2255
Female	-0.6389*	0.1616	-0.1360
Black_Non_Hispanic	-0.1457	0.1214	-0.0338
Hispanic	-0.2559***	0.1556	-0.0583
Otherrace	-0.0436	0.1549	-0.0103
SWC	0.3977	0.2560	0.0972
MNC	0.3137	0.2872	0.0763
MWC	0.4745*	0.0650	0.1164
Up_to_College	0.0853	0.1240	0.0203
Academy	0.1776***	0.0925	0.0427
ROTC_Non_Scholarship	0.1486	0.4564	0.0357
OCS	0.2444	0.2549	0.0591
Appointment	1.9230*	0.2155	0.4267
Other_Source	0.2889	0.2747	0.0701
Prior_Enlisted	-2.4435*	0.2829	-0.3312
- 2 Log L = 8,459 Pr>ChiSq = <. 0001	N = 6,530 DF = 20 R_p^2 = 67.1		Pred.Prob. =0.38221

***   = Significant at 10%
**   = Significant at 5%
*   = Significant at 1%

4.   AIR FORCE

Table 17 presents the ten-year logit analysis results for the Air Force. Among the four commissioning source variables only "appointment" is significant at the 1% level and has the expected sign. All of the remaining commissioning source variables are insignificant. Compared to ROTC_scholarship graduates direct appointment commissionees are less likely to stay in the military beyond minimum service requirement.

The Air Force model has a log likelihood ratio of 46,462 with 19 degrees of freedom and a probability value of < .0001. Therefore, it can be concluded that the null hypothesis that the coefficients of all the analysis variables in the model are zero is

rejected. R_p^2 equals 60: The model predicts 60% of the events (stayers) and non-events (leavers) correctly

Table 17. Ten-Year Retention Model for the Air Force

VARIABLE	ESTIMATE	STD. ERROR	PARTIAL
Intercept	0.0134	0.0705	0.5033
Reserve	-0.4165*	0.0659	-0.1028
O2_plus	-0.6526*	0.0504	-0.1579
Female	-0.5470*	0.0335	-0.1337
Black_Non_Hispanic	0.1048**	0.0511	0.0262
Hispanic	-0.0286	0.0826	-0.0072
Otherrace	-0.0859	0.0611	-0.0215
SWC	0.2440*	0.0830	0.0607
MNC	0.2816*	0.0670	0.0700
MWC	0.2736*	0.0267	0.0679
Up_to_College	-0.0618	0.1648	-0.0155
Academy	0.0337	0.0719	0.0084
ROTC_Non_Scholarship	-0.0444	0.0340	-0.0111
OCS	-0.2054	0.0359	-0.0512
Appointment	-0.1743*	0.0485	-0.0435
Prior_Enlisted	0.1172*	0.0387	0.0293
- 2 Log L = 46,462 Pr>ChiSq = <. 0001	N = 34,004 DF = 19 $R_p^2 = 60$		Pred.Prob. =0.50334

*** = Significant at 10%
**   = Significant at 5%
*   = Significant at 1%

E.   CROSS TABULATION ANALYSIS OF MSR RETENTION

Tables 18 through 22 display the MSR retention rates of officers by sex, race, paygrade, service, occupation, commissioning source and fiscal year.

1.   Cross Tabulation of Sex and MSR Retention

There were 100,664 males in the sample, and 38,648 (38.39%) of those left the military at MSR. Females comprised 17,728 of the sample population and 50.69% of the female officers left at MSR.

Table 18. Cross Tabulation of Sex and MSR Retention

SEX	STAY		LEAVE		TOTAL
	N	%	N	%	N
MALE	62,016	52.38%	38,648	32.64%	100,664
FEMALE	8,741	49.31%	8,907	50.69%	17,728

2. Cross Tabulation of Race_Ethnic and MSR Retention

The majority of officers were White (103,499); 41,405 (40%) of White officers left the military. Blacks were the second largest group in the data file (7,638). At the end of initial commitment 42.04% of Black officers left the military. Hispanics comprised a small portion of the sample (2,865). Black and Hispanic officers' separation rates were close (42.04% versus 43,24%).

Table 19. MSR Retention Rates by Race_Ethnic

RACE_ETHNIC	STAY		LEAVE		TOTAL
	N	%	N	%	N
WHITE	62,094	59.99%	41,405	40.01%	103,499
BLACK	4,846	57.96%	3,211	42.04%	7,638
HISPANIC	1,625	56.72%	1,240	43.28%	2,865
OTHER	2,656	60.50%	1,734	39.50%	4,390

3. Cross Tabulation of Paygrade and MSR Retention

The retention rate of officers in paygrade O1 (61.27%) was higher than the retention rate of officers in higher paygrades (49.56%). The bulk of officers leaving the military after the initial commitment were in paygrade O1 (39,974).

Table 20. Retention Rates by MSR Paygrade

PAYGRADE	STAY		LEAVE		TOTAL
	N	%	N	%	N
O1	63,229	61.27%	39,974	38.73%	103,203
O2_PLUS	7,528	49.56%	7,660	50.43%	15,188

4. Cross Tabulation of Commissioning Source Fiscal Year and MSR Retention

Table 21 and Figure 7 display the retention rates of officers by commissioning source between FY 1985 and FY 1992. By using a column chart, the change in retention rate can be observed easily. Average retention rate for the sample is 59.49%. ROTC scholarship graduates have the highest retention rate at 64.33%. Officers entering through direct appointment programs have the lowest retention rate at 51.28%.

Table 21.   MSR Retention Rates by Commissioning Source and Fiscal Year

YEAR		ACADEMY		ROTC_NON_S		ROTC_SCH		OCS/OTS		APPOINT.		TOTAL	
		S	L	S	L	S	L	S	L	S	L	S	L
85	N	709	748	1671	1090	1718	864	3420	1987	697	665	8215	5354
	%	48.66%	51.34%	60.52%	39.48%	66.54%	33.46%	63.25%	36.75%	51.17%	48.83%	60.54%	39.46%
86	N	1821	1164	1418	888	2665	2026	3279	1994	1105	1020	10288	7092
	%	61.01%	38.99%	61.49%	38.51%	56.81%	43.19%	62.18%	37.82%	52.00%	48%	59.19%	40.81%
87	N	1851	1172	1633	1132	1906	1574	2234	1657	870	882	8494	6417
	%	61.23%	38.77%	59.06%	40.94%	54.77%	45.23%	57.41%	42.59%	49.66%	50.34%	56.96%	43.04%
88	N	1838	1182	2461	1615	2056	1120	1426	1090	1352	1298	9133	6305
	%	60.86%	39.14%	60.38%	39.62%	64.74%	35.26%	56.68%	43.32%	51.02%	48.98%	59.16%	40.84%
89	N	1882	1183	2506	1661	2016	1031	1479	761	1478	1322	9361	5958
	%	61.40%	38.60%	60.14%	39.86%	66.16%	33.84%	66.03%	33.97%	52.79%	47.21%	61.11%	38.89%
90	N	1828	1045	2031	1348	1949	1008	1547	1014	1512	1369	8867	5784
	%	63.63%	36.37%	60.11%	39.89%	65.91%	34.09%	60.41%	39.59%	52.48%	47.52%	60.52%	39.48%
91	N	1768	1099	2122	1474	1779	828	1097	591	1304	1245	8070	5237
	%	61.67%	38.33%	59.01%	40.99%	68.24%	31.76%	64.99%	35.01%	51.16%	48.84%	60.64%	39.36%
92	N	1793	1237	1882	1306	1831	732	1010	503	1104	1105	7620	4883
	%	59.17%	40.83%	59.03%	40.97%	71.44%	28.56%	66.75%	33.25%	49.98%	50.02%	60.95%	39.05%
T	%	59.70%	40.30%	59.97%	40.03%	64.33%	35.67%	62.21%	37.79%	51.28%	48.72%	59.49%	40.5%

ROTC non-scholarship program graduates and direct appointment commissionees have steady rates around 60% and 51%, respectively. ROTC scholarship program graduates have an increasing trend of retention since fiscal year 1987. OCS/OTS graduate officers have varying retention rates over time (between 56.68% 66.75%). Figure 7 shows the retention rates by fiscal year and commissioning source graphically.

Figure 7.   MSR Retention Rates by Commissioning Source and Fiscal Year
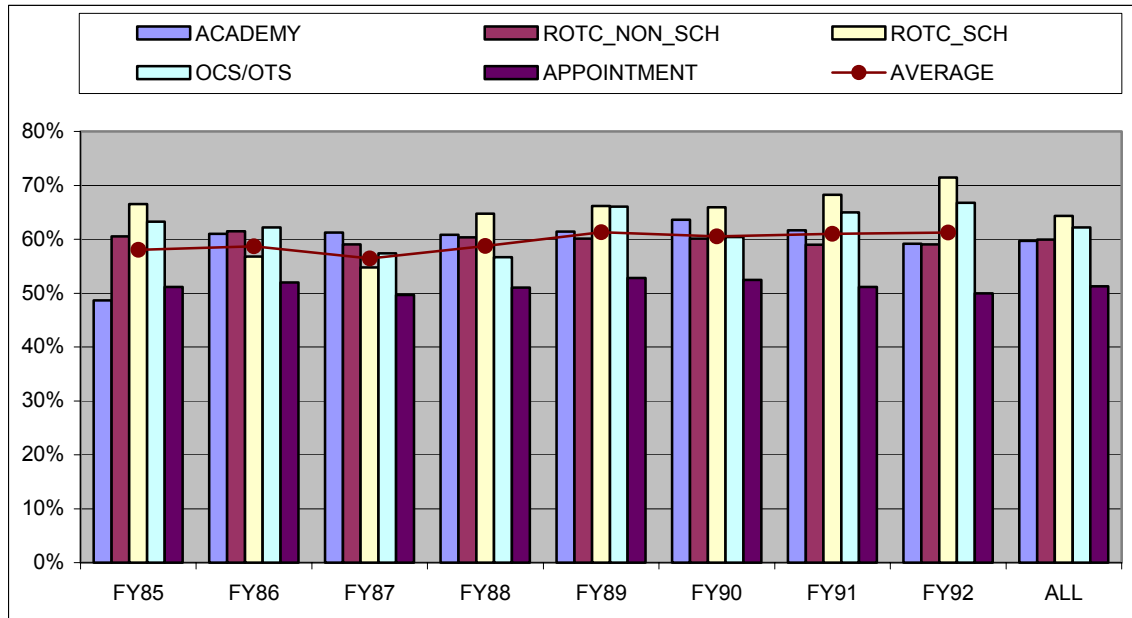
Table 22.   MSR Retention Rates by Service and Occupation

	Army		Navy		Marine		Air Force		Total	
	S	L	S	L	S	L	S	L	S	L
Tact.Opr.	51%	49%	45%	55%	38%	62%	73%	27%	56%	44%
N	9017	8526	226	278	174	278	4370	1636	13787	10718
Intelligence	49%	51%	65%	35%	14%	86%	65%	35%	58%	42%
N	843	871	396	215	1	6	1306	717	2546	1809
Eng& Mai	46%	54%	60%	40%	52%	48%	65%	35%	59%	41%
N	1711	2022	649	435	14	13	5037	2730	7411	5200
Scientists	50%	50%	49%	51%	30%	70%	63%	37%	57%	43%
N	400	402	278	292	124	287	2008	1160	2810	2141
Health Car	58%	42%	51%	49%	0%	0%	45%	55%	50%	50%
N	3444	2534	1457	1373	0	0	4505	5493	9406	9400
Admin.	53%	47%	50%	50%	42%	58%	68%	32%	62%	38%
N	913	808	657	646	18	25	3171	1499	4759	2978
Supply	45%	55%	49%	51%	26%	74%	66%	34%	53%	47%
N	929	1150	653	686	32	91	1500	787	3114	2714
Non-Occ.	100%	0%	59%	41%	56%	44%	77%	23%	65%	35%
N	3	0	8710	6096	5594	4401	12588	3783	26895	14280

5. Cross Tabulation of Service, Occupation and MSR Retention

Table 22 above displays the retention rate for all services by broad DOD primary occupation categories. In the Army, health care officers have the highest retention rate at 58%. In the Navy, the Marine Corps and the Air Force intelligence officers (65%), engineers (52%) and administrators (68%) have the highest retention rates. In the Marine Corps intelligence and supply officers have very low retention rates (14% and 26%). The Air Force has the highest overall retention rates among the services.

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V.   SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

This chapter summarizes the results in Chapter IV and reviews the conclusions derived from the quantitative analysis of the relation between commissioning source and officer retention. The definitive goal of this study is to provide policymakers with accurate information for setting and implementing personnel policies.

A.   SUMMARY

Partial effects of the variables in Tables 8 through 17 are the percentage point differences between the base case predicted probability and the probability of the outcome from a one-unit change in each explanatory variable. The percentage effects of each variable are calculated by dividing the partial effect by the model base case predicted probability. For example, in Table 8, the partial effect of 'Academy' equals – 0.0162 and the predicted probability for the base case is 0.5204. The calculation is as follows:

Percentage Effect $_{ACADEMY}$ = -0.0162/0.5204 = -3.11%

Tables 23 and 24 show the percentage effects of each commissioning source in the MSR and ten-year retention models. The asterisks indicate which estimated logit coefficients were statistically significant.

Table 23.   Percentage Effects of Commissioning Source on MSR Retention

Source of Commission	All-DOD	Army	Navy	USMC	Air Force
Academy	-3.11%*	-20.94%*	0.87%	6.24%	5.95%*
ROTC_Non_sch	13.39%*	12.59%*	-1.36%	6.16%	5.83%*
OCS	4.32%*	10.69%*	2.43%	32.15%*	2.50%**
Appointment	-3.98%*	20.05%*	7.94%*	64.87%*	-11.19%*

Table 24.   Percentage Effects of Commissioning Source on Ten-Year Retention

Source of Commission	All-DOD	Army	Navy	USMC	Air Force
Academy	4.76%**	-18.80%*	16.69%*	11.17%***	1.67%
ROTC_Non_sch	5.59%*	2.79%	10.40%	9.34%	-2.21%
OCS	-5.12%*	1.22%	10.97%**	15.46%	-10.17%
Appointment	-0.89%	-4.85%	29.59%*	111.64%*	-8.64%*

There are significant differences in officer retention across commissioning sources. The directions and the magnitudes of the effects are not the same in the MSR and the ten-year retention models.

Academy: In the all-DOD models, the percentage effects of 'Academy' are very close; however the signs of the effect are opposite in the MSR and ten-year models. The magnitude of 'Academy' is highest in both of the Army retention models and lowest in the MSR Navy retention model. The direction of the effect is almost identical between the two sets of models.

ROTC Non-scholarship: Both set of models find this commissioning program has a positive effect on retention. In the Navy and Air Force models, the signs change. Also, magnitudes of the effects differ significantly between the two sets of models. The largest difference is between the Army models, for MSR and ten-year retention.

OCS: Just like the ROTC non-scholarship variable, the direction of the effect is the same (positive) in most of the models. The magnitudes, however, differ significantly between the two retention models. The magnitude of OCS is highest in MSR Marine Corps retention models.

Appointment: Except for the Army models, directions of the effect are the same. Appointment has the highest magnitude in the ten-year Marine Corps retention model and the lowest magnitude in the ten-year DOD model.

B. CONCLUSIONS

This thesis focused on the effect of commissioning sources on the retention of officers who are at the end of the minimum service requirement and at ten years of service. By analyzing personnel data drawn from DMDC Officer Master Files, this study found that several factors are important in explaining officer retention behavior. The simple turnover theory suggested that voluntary personnel turnover is a function of several factors such as personal and demographic characteristics, individual perceptions and organizational characteristics.

The data file used in the analysis of officer retention contained "sex," "race and ethnic origin," "marital status," "dependency status," and "education level" as personal and demographic characteristics; "paygrade," "prior enlisted service in the military," "commissioning source," "component," and "service," are used to reflect organizational characteristics. Also, to control for the effects of outside factors such as personnel policy changes in the military or the effects of the economy on military incentives (pay and benefits), several fiscal year group dummy variables were used in the analysis. The data file did not include any information on individual perceptions such as job satisfaction or organizational commitment as these were not available in archival data.

The data consisted of the population of officers who entered the military between 1985 and 1995. However, only data regarding officers who entered the military between 1985 and 1992 could be used in the analysis since an officer entering the service in 1993 could not be followed up to the retention decision point at the end of MSR, which is seven years for any Service Academy graduate. Because of the setup of the dependent variable "STAY" in this analysis, all officers who entered the military in 1993 or later have zero retention rates. The primary objective of this thesis is to examine the initial commitment (MSR) retention; hence using data on fiscal years 1993 to 1995 could produce erroneous results. In the ten-year retention models only data on cohorts for 1985 to 1989 could be used.

In many cases the DMDC data for a given variable were coded as "unknown." Logit models do not use observations with unknown ("0") values in the analysis of the dependent variable. Therefore, all analysis variables with unknown fields were deleted. Likewise, irrelevant data such as warrant officers and warrant officer commissioning sources were deleted because warrant officers are beyond the scope of this thesis. Deletions comprised almost 51% of the original data file. Also, a coding error in the Officer Master File regarding the ROTC scholarship and ROTC non-scholarship program graduates in the "Army" was corrected prior to the analysis.

A logit regression was run with "STAY" as the response variable. Ten retention models were estimated to predict the retention behavior of officers at different time frames at the all DOD and the individual service levels. The primary purpose of this

thesis was to determine if commissioning source affects decisions of officers who are at the end of their obligated service. This study found that the commissioning source affects the retention decisions of officers at the end of the initial commitment. In the MSR retention model at the all-DOD level, all commissioning source variables are significant at the 1% level and have the expected coefficient signs. In the ten-year retention model only direct appointment is not significant and OCS has an opposite sign.

1. Service Academies

Each of the three service academies of the U.S. Armed Forces educates and trains approximately 4,000 students every year. Approximately 1,000 new officers are graduated and commissioned from each academy annually. Officers who enter the service academies as the top quality high school graduates have a retention rate of 59.70% at the end of the minimum service requirement. Academy graduates are 3.11% less likely to stay in the military beyond minimum service requirement compared to ROTC scholarship graduates, a fairly small difference.

ARMY: Academy is significant at the .01 level in both models (MSR retention and ten-year retention). Both models predict the direction of "academy" as negative, but there is a slight difference in the magnitude. For the MSR retention model, military academy graduates are 20.94% less likely to stay in the military beyond MSR compared to ROTC scholarship graduates. For the ten-year retention model military academy graduates are 18.80% less likely to stay in the military beyond MSR compared to ROTC scholarship graduates.

NAVY: Academy is not significant in the MSR retention model. It is significant at the .01 level in the ten-year retention model. Naval academy graduates are 16.69% more likely to stay in the military beyond MSR compared to ROTC scholarship graduates.

MARINE CORPS: Academy is not significant in the MSR retention model. It is significant at the .10 level in the ten-year retention model. Naval academy graduates are 6.24% more likely to stay in the military beyond MSR compared to ROTC scholarship graduates, and 11.17% more likely to stay for ten years.

AIR FORCE: Academy is not significant in the ten-year retention model. It is significant at the .01 level in the MSR retention model. Air Force academy graduates are 5.95% more likely to stay in the military beyond minimum service requirement compared to ROTC scholarship graduates.

2.   ROTC Scholarship and Non-Scholarship Programs

ROTC programs (scholarship and non-scholarship) supply the highest percentage of new officers to the U.S. military. ROTC scholarship graduates have the highest retention rates among all the commissioning sources (64.33%). According to the all-DOD MSR analysis results ROTC non-scholarship graduates are 13.39% more likely to stay in the military beyond minimum service requirement compared to ROTC scholarship graduates.

ARMY: ROTC non-scholarship is only significant at the .01 level in the MSR retention model. For the MSR retention model, ROTC non-scholarship program graduates are 12.59% more likely to stay in the military beyond minimum service requirement compared to ROTC scholarship graduates.

NAVY & MARINE CORPS: ROTC non-scholarship is not significant in either retention model.

AIR FORCE: ROTC non-scholarship is not significant in the ten-year retention model. It is significant at the .01 level in the MSR retention model. Air Force ROTC non-scholarship graduates are 5.83% more likely to stay in the military beyond MSR compared to ROTC scholarship graduates.

3.   Officer Candidate/Training Schools

Officer Candidate Schools or Officer Training Schools are very flexible compared to the other officer commissioning sources. As stated earlier, for the exceptional non-commissioned officers who have proved themselves in the enlisted ranks, Officer Training Schools and Officer Candidate Schools are also the gateways of admission into the officer corps. Officer Candidate and Training Schools graduates have an all DOD

retention rate of 62.21%. OCS/OTS graduate officers are 4.32% more likely to stay in the military beyond the initial commitment than an officer with the base case characteristics.

ARMY: OCS is only significant at the .01 level in the MSR retention model. For the MSR retention model, OCS graduates are 10.69% more likely to stay in the military beyond minimum service requirement compared to ROTC scholarship graduates.

NAVY: OCS is not significant in the MSR retention model. It is significant at the .05 level in the ten-year retention model. OCS graduates are 10.97% more likely to stay in the military beyond minimum service requirement compared to ROTC scholarship graduates.

MARINE CORPS: OCS is not significant in the ten-year retention model. It is significant at the .01 level in the MSR retention model. OCS graduates are 32.15% more likely to stay in the military beyond minimum service requirement compared to ROTC scholarship graduates.

AIR FORCE: OCS is not significant in the ten-year retention model. It is significant at the .05 level in the MSR retention model. OCS graduates are 2.50% more likely to stay in the military beyond minimum service requirement compared to ROTC scholarship graduates.

4. Direct Appointment Accessions

Officers entering the military via direct appointments were hypothesized to have lower retention rates than their counterparts commissioned through other sources. As expected, both of the DOD level models predict the direction of the effect correctly. According to the MSR retention model, officers coming from direct appointment programs are 3.98% less likely to stay in the military beyond the initial commitment compared to ROTC scholarship program graduates.

ARMY: Appointment is only significant at the .01 level in the MSR retention model. For the MSR retention model, direct appointment commissionees are 20.05% more likely to stay in the military beyond minimum service requirement compared to ROTC scholarship graduates.

NAVY: Appointment is significant in both models at the .01 level. The direction of the effect is predicted incorrectly. The magnitudes are slightly different (7.94% in the MSR versus 29.59% in the ten year). Direct appointment commissionees are 7.94% more likely to stay in the military beyond minimum service requirement compared to ROTC scholarship graduates.

MARINE CORPS: Just like the Navy, direct appointment is significant in both models at the .01 level and the direction of the effect is predicted incorrectly. The magnitudes are different (64.87% in the MSR versus 11.64% in the ten year). Direct appointment commissionees are 64.87% more likely to stay in the military beyond minimum service requirement compared to ROTC scholarship graduates.

AIR FORCE: Appointment is significant in both models at the .01 level. The direction of the effect is predicted correctly. The magnitudes are close (11.19% in the MSR versus 8.64% in the ten year). Direct appointment commissionees are 11.19% less likely to stay in the military beyond minimum service requirement compared to ROTC scholarship graduates.

Although there are only a few studies addressing the effect of commissioning source on officer retention beyond minimum service requirement, the findings of this thesis are generally consistent with previous studies. An important finding of this thesis is that there are significant differences in officer retention across commissioning sources, but that the differences are not large in magnitude.

C. RECOMMENDATIONS

The problems in variable coding and the large amount of data with unknown fields in the DMDC files make the representation of several characteristics unreliable. These problems should be overcome in the raw DMDC data files in order to avoid the adverse effect that occurs when screened data may lead to measurement error.

This thesis found that the retention rates of officers commissioned through the five major sources differ substantially. However, the effect of commissioning source on the retention of officers at the end of minimum service requirements is not large. Previous studies also found out that performance measures (retention and promotion

rates) do not vary substantially among various commissioning sources. Therefore, at a time of decreased budget and military spending, the U.S. military and DOD should reconsider how heavily it draws from each source. Rearranging the mix of officers drawn from each commissioning source in the U.S military (without closing down any of the officer commissioning sources) should be informed by cost considerations. Also, a cost effectiveness analysis should factor in the unique advantages and disadvantages of each commissioning program.

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19. Quadrennial Defense Review, 2001

APPENDIX A

Figure 8.   Active Component Officer End-strength, by Service, FY73/99
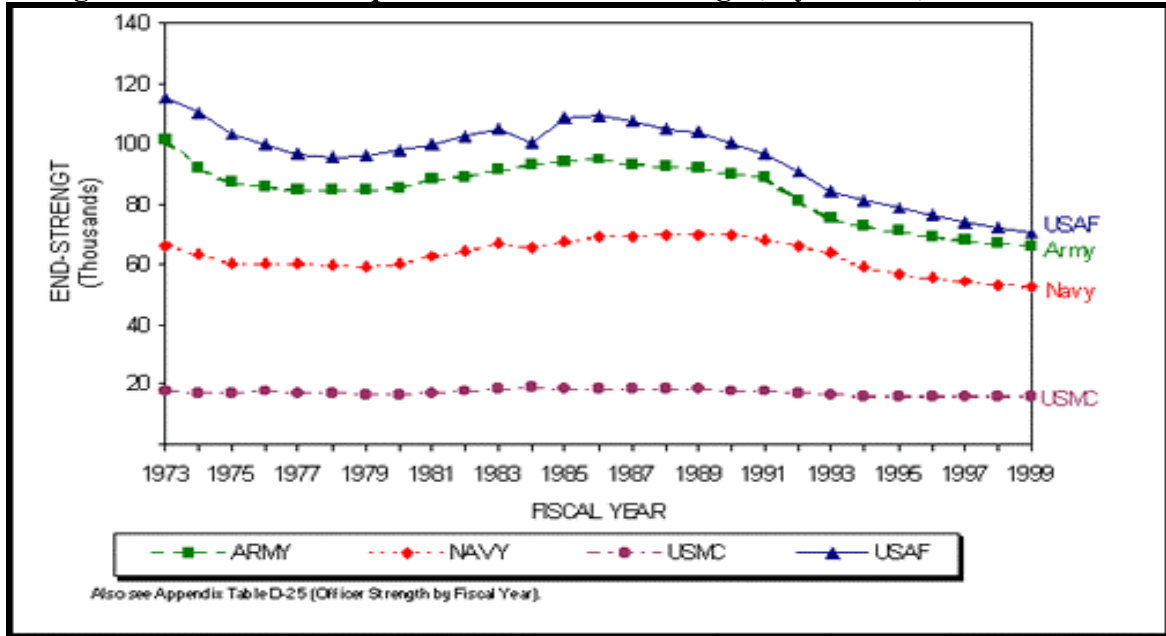
Source: Http://dticaw.dtic.mil/prhome/poprep99

Figure 9.   Reserve Component Officer End-strength, FY 74/99
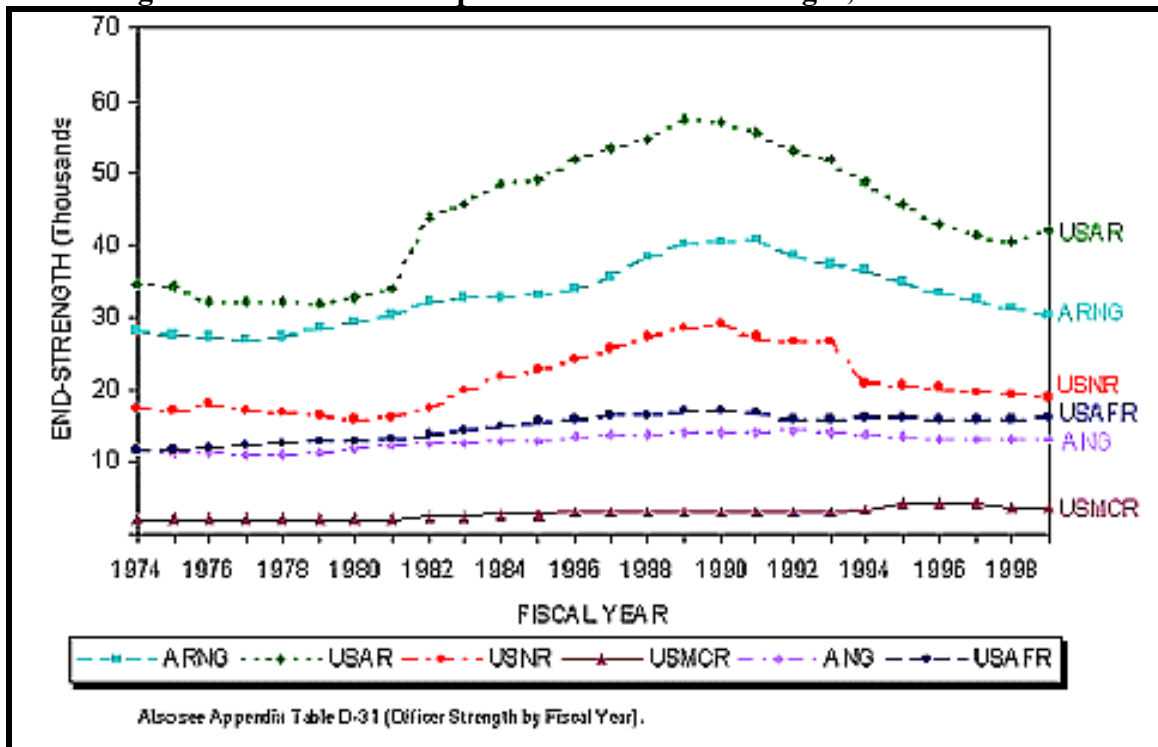
Source: Http://dticaw.dtic.mil/prhome/poprep99

Table 25.   Officer Continuation Rates (Active Duty Percentage Changes – FY 98/00)

DOD TOTAL	WHITE			BLACK			HISPANIC			OTHER			TOTAL		
GRADE	FY 1998	FY 1999	FY 2000	FY 1998	FY 1999	FY 2000	FY 1998	FY 1999	FY 2000	FY 1998	FY 1999	FY 2000	FY 1998	FY 1999	FY 2000
O-10	71.9	63.3	77.4	100	66.7	33.3	0	0	0	0	100	100	74.3	64.7	74.3
O-9	77.2	80.4	73.3	100	100	100	0	0	0	100	0	0	77.8	80.9	74.2
O-8	82.9	81.9	79.2	81.8	84.6	93.3	66.7	33.3	100	100	50	33.3	83	81.1	79.5
O-7	90.5	89	88.8	89.7	96	73.9	66.7	83.3	100	66.7	100	100	90	89.4	88.3
O-6	82.3	84.4	83.1	88.4	88.4	87.6	85.4	89.8	89.3	83.7	85.1	84.1	82.6	84.7	83.5
O-5	88	88.4	87.6	89.7	89.2	88.2	90.9	89.3	89.1	88.6	88.8	85.6	88.2	88.5	87.6
O-4	92.6	91.6	91.7	92.8	93.1	93.2	91.8	92.9	91.6	92.6	93.1	91.8	92.6	91.8	91.9
O-3	89.2	88.1	88	91.7	90	89.9	89.1	88.2	88.3	89.2	88.5	88.6	89.4	88.2	88.2
O-2	91.6	91.4	91.6	90.7	92.2	92.3	93.3	91.6	92.4	91.1	91.5	92.4	91.6	91.5	91.7
O-1	98.4	98.6	98.6	97.7	98	97.5	98.4	98.3	98.5	99.2	99	98.5	98.4	98.6	98.5
TOTAL OFFICER	90.6	90.2	90	92.3	91.8	91.6	91.8	91.4	91.9	91.6	91.5	91.2	90.8	90.4	90.3

Source: Annual Defense Report to the President and the Congress (2001, Table F-19, Page F-22)

Table 26.   Military Personnel Strength (End Fiscal year – FY 89/00)

	FY 1989	FY 1990	FY 1991	FY 1992	FY 1993	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000
Active Component												
Army	769.7	750.6	725.4	611.3	572.4	541.3	508.6	491.1	491.7	483.9	479.4	482.2
Navy	592.7	582.9	571.3	541.9	510.0	468.7	434.6	416.7	395.6	382.3	373.0	373.3
Marine Corps	197.0	196.7	195.0	184.6	178.4	174.2	174.6	174.9	173.9	173.1	172.6	173.3
Air Force	570.9	539.3	510.9	470.3	444.4	426.3	400.4	389.0	377.4	367.5	360.6	355.7
Total	2130.2	2069.4	2002.6	1808.1	1705.1	1610.5	1518.2	1471.7	1438.6	1406.8	1385.7	1384.4
Reserve Component Military (Selected Reserve)												
Army National Guard	457.0	437.0	441.3	426.5	409.9	369.9	374.9	370.0	370.0	362.4	357.5	353.0
Army Reserve	319.2	299.1	299.9	302.9	275.9	259.9	241.3	226.2	212.9	205.0	205.2	206.9
Naval Reserve	151.5	149.4	150.5	142.3	132.4	107.6	100.6	98.0	95.3	93.2	89.0	86.3
Marine Corps Reserve	43.6	44.5	44.0	42.3	41.7	40.7	40.9	42.1	42.0	40.8	40.0	39.7
Air National Guard	116.1	117.0	117.6	119.1	117.2	113.6	109.8	110.5	110.0	108.1	105.7	106.4
Air Force Reserve	83.2	83.8	84.5	81.9	80.6	79.6	78.3	73.7	72.0	72.0	71.7	72.3
Total	1170.6	1130.8ᵉ	1137.8ᵉ	1114.9	1057.7	971.3	945.8	920.4	902.2	881.5	869.1	864.6

Source: Annual Defense Report to the President and the Congress (2001, Table C-1, Page F-C-1)

Table 27.   Officer Gains Report

	Source of Commission	FY90	FY91	FY92	FY93	FY94	FY95	FY96	FY97	FY98	FY99	FY00
ARMY	Academy	976	979	964	1083	1048	1024	912	940	896	991	992
	ROTC Sch.	1516	1361	1357	1314	1469	1557	1470	2183	2114	1890	2241
	ROTC Other	2509	1572	1575	1626	1829	1923	1502	1260	1152	892	969
	OCS	253	350	258	301	544	379	359	264	303	592	548
	Direct App.	1039	904	871	2195	1669	1782	1728	1919	1955	1823	276
	Other	3	10	5	12	214	1	2	0	1	0	459
	Unknown	1826	1755	1192	387	50	24	18	62	36	41	1306
	Total	8122	6931	6222	6918	6823	6690	5991	6628	6457	6229	6791
NAVY	Academy	921	858	886	852	775	799	791	811	781	764	812
	ROTC Sch.	1426	1307	1101	961	1024	993	797	691	672	784	829
	ROTC Other	207	212	191	151	97	60	103	73	59	63	115
	OCS	1274	613	676	546	519	709	787	899	949	1063	1200
	Direct App.	2957	2358	2093	1577	1326	1313	1111	1087	1198	1347	1325
	Other	78	152	404	203	617	519	668	541	553	714	775
	Unknown	0	0	0	0	37	37	25	22	11	46	7
	Total	6863	5500	5351	4290	4395	4430	4282	4124	4223	4781	5063
MARINE	Academy	96	99	151	194	192	125	179	152	155	152	164
	ROTC Sch.	307	307	276	230	209	158	210	108	170	168	218
	ROTC Other	0	0	0	0	0	0	0	0	0	0	0
	OCS	934	831	859	513	664	598	874	989	852	916	641
	Direct App.	4	12	4	3	5	5	9	2	18	3	246
	Other	261	260	303	278	307	565	535	376	452	455	444
	Unknown	0	4	4	0	2	0	0	0	0	0	5
	Total	1602	1513	1597	1218	1379	1451	1807	1627	1647	1694	1718
AIR FORCE	Academy	1008	977	1085	969	1005	1022	964	810	947	956	945
	ROTC Sch.	793	1044	783	1107	1114	1321	1168	1407	1535	1480	1228
	ROTC Other	1228	1271	1138	1195	695	486	498	510	517	573	4
	OCS	623	453	364	374	693	893	699	555	535	1053	2158
	Direct App.	1742	1416	1477	1128	1250	1287	1424	1277	1223	1023	1116
	Other	1	1	2	20	105	41	25	14	6	5	5
	Unknown	19	10	8	0	0	0	0	0	0	0	0
	Total	5414	5172	4857	4793	4862	5050	4778	4573	4763	5090	5456
DOD TOTAL	Academy	3001	2913	3086	3098	3020	2970	2846	2713	2779	2863	2913
	ROTC Sch.	4042	4019	3517	3612	3816	4029	3645	4389	4491	4322	4516
	ROTC Other	3944	3055	2904	2972	2621	2469	2103	1843	1728	1528	1088
	OCS	3084	2247	2157	1734	2420	2579	2719	2707	2639	3624	4547
	Direct App.	5742	4690	4445	4903	4250	4387	4272	4285	4394	4196	2963
	Other	343	423	714	513	1243	1126	1230	931	1012	1174	1683
	Unknown	1845	1769	1204	387	89	61	43	84	47	87	1318
	Total	22001	19116	18027	17219	17459	17621	16858	16952	17090	17794	19028

Source: www.https://www.dmdc.osd.mil/ids/owa/ids_Accession.xls1_4

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APPENDIX B

Table 28.   Hypothesized Signs

Variable Demographics	Description	Predicted Sign
MALE	BASE CASE	
FEMALE	Female officers are less likely to stay due to the hard service conditions.	-
SNC	BASE CASE	
SWC	Having dependents or being married make leaving military more difficult due to the difficulties in finding employment with similar pay and benefits.	+
MNC		+
MWC		+
WHITE_NON_HISPANIC	BASE CASE	
BLACK_NON_HISPANIC	Minorities experience more unemployment rates than Whites. Military is a good opportunity for minorities.	+
HISPANIC		+
OTHERRACE		+
REGULAR	BASE CASE	
RESERVE	Officers serving in the reserve component have less incentive to stay than officers serving in the active component.	-
PRIOR_ENLISTED	Prior enlisted servicemembers have more incentive to stay than their not prior enlisted counterparts.	+
ARMY	BASE CASE	
NAVY	Serving in the Navy, the Marine Corps and the Air Force is easier compared to serving in the Army.	+
MARINE		+
AIR FORCE		+
Paygrade		
O1	BASE CASE	
O2_PLUS	Officers in paygrades O2 and up have incentive to stay (experience) and to leave (better job opportunities outside).	?

Variable	Description	Predicted Sign
Commissioning Source		
ACAD	Naturally, service academies produce career-oriented officers. However, education level of academies makes academy graduate officers marketable in the civilian sector. The same idea applies to Non-scholarship ROTC graduates.	?
ROTC_NON_SCH		?
ROTC_SCH	BASE CASE	
OCS	OCS and OTS are the major sources of passage to officer corps for enlisted servicemembers.	+
APPOINT	Officers commissioned through direct appointments are more marketable in the civilian sector.	-
OTHER_SOURCE	No information on what the other sources are.	?
Fiscal year		
FY85	BASE CASE	
FY86		
FY87		
FY88		
FY89	Fiscal year variables used in the analysis in order to control for the effect of the outside factors such as personnel policy changes in the military or economic effects on military incentives such as pay and benefits.	
FY90		
FY91		
FY92		
FY93		
Education Level		
UPTOCOLL	Non-college graduates have less job opportunities in the civilian sector.	+
COLL	BASE CASE	

Table 29.   Frequencies for Explanatory Variables (Source of Commission)

SOURCE_OF_COMMISSION	Original Data File		Screened Data File	
	Cases	Percentage	Cases	Percentage
ARMY_ACADEMY	33,170	16.87 %	22,320	18.85 %
ROTC	38,928	19.81 %	25,103	21.20 %
ROTC_SCHOLARSHIP	42,139	21.44 %	26,238	22.16 %
OCS	38,482	19.58 %	25,089	21.19 %
APPOINTMENT	40,584	20.65 %	18,328	15.48 %
OTHER_SOURCE	3,249	1.65 %	1,314	1.51 %
TOTAL	196,552	100 %	118,392	100 %

Table 30.   Frequencies for Explanatory Variables (Component)

COMPONENT	Original Data File		Screened Data File	
	Cases	Percentage	Cases	Percentage
REGULAR	62,099	29.09 %	39,246	33.15 %
RESERVE	151,344	70.91 %	79,146	66.85 %
TOTAL	213,443	100 %	118,392	100 %

Table 31.   Frequencies for Explanatory Variables (Education)

EDUCATION	Original Data File		Screened Data File	
	Cases	Percentage	Cases	Percentage
UPTOCOLL	10,266	5.97 %	1,790	1.51 %
COLL	161,694	93.94 %	116,596	98.48 %
TOTAL	171,960	100 %	118,392	100 %

Table 32.   Frequencies for Explanatory Variables (Race_Ethnic)

RACE_ETHNIC	Original Data File		Screened Data File	
	Cases	Percentage	Cases	Percentage
WHITE	181,051	85.56 %	103,499	87.42 %
BLACK	15,616	7.38 %	7,638	6.45 %
HISPANIC	5,583	2.64 %	2,865	2.42 %
OTHERRACE	9,352	4.42 %	4,390	3.71 %
TOTAL	211,602	100 %	118,392	100 %

Table 33. Frequencies for Explanatory Variables (Paygrade)

PAYGRADE	Original Data File		Screened Data File	
	Cases	Percentage	Cases	Percentage
O1	176,763	82.72 %	103,203	87.17 %
O2_PLUS	8,798	4.12 %	15,188	12.83 %
TOTAL	213,682	100 %	118,391	100 %

Table 34. Frequencies for Explanatory Variables (Sex)

SEX	Original Data File		Screened Data File	
	Cases	Percentage	Cases	Percentage
MALE	176,734	82.72 %	100,664	85.03 %
FEMALE	36,912	17.28 %	17,728	14.97 %
TOTAL	213,646	100 %	118,392	100 %

Table 35. Frequencies for Explanatory Variables (Marital Status/Number of Dependents)

NUMBER_OF_DEPENDENTS	Original Data File		Screened Data File	
	Cases	Percentage	Cases	Percentage
SNC	122,670	60.51 %	78,940	66.68 %
SWC	8,109	4.01 %	4,699	3.97 %
MNC	7,076	3.47 %	3,290	2.78 %
MWC	64,873	31.99 %	31,463	26.58 %
TOTAL	202,728	100 %	118,392	100 %

Table 36. Frequencies for Explanatory Variables (Service)

SERVICE	Original Data File		Screened Data File	
	Cases	Percentage	Cases	Percentage
ARMY	70,828	33.14 %	33,940	26.28 %
NAVY	60,077	28.11 %	31,627	24.48 %
MARINE CORPS	14,701	6.88 %	11,075	8.57 %
AIR FORCE	68,102	31.87 %	52,527	40.67 %
TOTAL	213,708	100 %	118,392	100 %

Table 37.   Cross Tabulation Analysis (Service by Education)

		Army	Navy	Marine	Air Force	Total
Unknown	N	24,498	24,060	1,256	4,578	54,392
	%	28%	37%	7%	7%	23%
Associate Degree	N	5,155	2,032	2,891	824	10,902
	%	6%	3%	17%	1%	5%
< Bachelor's	N	0	88	1	42	131
	%	0%	0%	0%	0%	0%
Bachelor's	N	49,832	35,786	12,705	53,996	152,319
	%	57%	55%	73%	79%	64%
> Bachelor's	N	7,613	3,083	498	8,910	20,104
	%	9%	5%	3%	13%	8%
Total	N	87,098	65,049	17,351	68,350	237,848
	%	100%	100%	100%	100%	100%

Table 38.   Cross Tabulation Analysis (Education by Source of Commission/N)

	Unknown	Associate Degree	Less than Bachelor's	Bachelor's	Higher than Bachelor's
Unknown	14,061	3,325	59	7,766	2,672
Any Academy	898	21	0	8,146	113
Army Academy	200	0	0	7,809	77
Navy Academy	83	3	0	7,999	24
Air Force Academy	84	4	0	8,032	59
Merc. Marine Acad.	9	0	0	12	2
ANG Academy	2	2	0	6	1
ROTC Scholarship	4,523	470	8	36,567	1,175
ROTC Non-sch.	5,477	398	5	32,401	1,472
OCS/OTS	6,681	884	11	27,269	1,447
Aviation Cadet	303	60	0	8	3
National G.St. OCS	4	1	0	20	15
Direct App. Prof.	5,983	53	0	1,159	8,392
Direct App. Non-Prof.	9,768	1,505	30	10,730	4,367
Aviation Train. Prog.	1,012	10	18	1,793	30
Direct App. Warr. Off.	2,048	762	0	311	22
Dir. App.C. Warr.Off.	1,982	455	0	59	28
Warr.Off.Avi.Tr. Prog.	589	1,45	0	193	5
Other Than Above	685	1,496	0	2,039	200
Total	54,392	10,902	131	152,319	20,104

Table 39.   Cross Tabulation Analysis (Education by Source of Commission/%)

	Unknown	Associate Degree	Less than Bachelor's	Bachelor's	Higher than Bachelor's
Unknown	50%	1%	0%	28%	10%
Any Academy	10%	%	0%	89%	1%
Army Academy	2%	0%	0%	97%	1%
Navy Academy	1%	0%	0%	99%	0%
Air Force Academy	1%	0%	0%	98%	1%
Merc. Marine Acad.	39%	0%	0%	52%	9%
ANG Academy	18%	18%	0%	55%	9%
ROTC Scholarship	11%	1%	0%	86%	3%
ROTC Non-sch.	14%	1%	0%	82%	4%
OCS/OTS	18%	2%	0%	75%	4%
Aviation Cadet	81%	16%	0%	2%	1%
National G.St. OCS	10%	3%	0%	50%	38%
Direct App. Prof.	38%	0%	0%	7%	54%
Direct App. Non-prof.	37%	6%	0%	41%	17%
Aviation Train. Prog.	35%	0%	1%	63%	1%
Direct App. Warr. Off.	65%	24%	0%	10%	1%
Dir. App.C. Warr.Off.	79%	18%	0%	2%	1%
Warr.Off.Avi.Tr. Prog.	26%	65%	0%	9%	0%
Other Than Above	15%	34%	0%	46%	5%
Total	23%	5%	0%	64%	8%

Table 40.   Cross Tabulation Analysis (Air Force Enlisted by Occupation)

	N		%	
	Not Prior Enlisted	Prior Enlisted	Not Prior Enlisted	Prior Enlisted
Unknown	658	23	97%	3%
General & Executive	5	0	100%	0%
Tactical Operations	6,264	924	87%	13%
Intelligence	2,347	292	89%	11%
Engineering & Maintenance	8,108	2,042	80%	20%
Scientists & Professionals	3,704	334	92%	8%
Health Care	14,487	1,577	90%	10%
Administrators	4,851	1,145	81%	19%
Supply, Procurement and Allied	2,738	396	87%	13%
Non-occupational	17,937	518	97%	3%
Total	61,099	7,251		

Table 41.   Cross Tabulation Analysis (Army Enlisted by Occupation)

	N		%	
	Not Prior Enlisted	**Prior Enlisted**	**Not Prior Enlisted**	**Prior Enlisted**
Unknown	1,375	19	99%	1%
General & Executive	11	0	100%	0%
Tactical Operations	33,023	18	100%	0%
Intelligence	3,293	8	100%	0%
Engineering & Maintenance	8,293	5	100%	0%
Scientists & Professionals	2,586	10	100%	0%
Health Care	16,072	114	99%	1%
Administrators	3,576	2	100%	0%
Supply, Procurement and Allied	5,120	2	100%	0%
Non-occupational	4	0	100%	0%
Total	73,353	178		

Table 42.   Cross Tabulation Analysis (Marine Enlisted by Occupation)

	N		%	
	Not Prior Enlisted	**Prior Enlisted**	**Not Prior Enlisted**	**Prior Enlisted**
Unknown	307	32	91%	9%
General & Executive	10	0	100%	0%
Tactical Operations	639	26	96%	4%
Intelligence	9	0	100%	0%
Engineering & Maintenance	33	1	97%	3%
Scientists & Professionals	565	6	99%	1%
Health Care	0	0	0%	0%
Administrators	54	5	92%	8%
Supply, Procurement and Allied	160	3	98%	2%
Non-occupational	12,696	616	95%	5%
Total	14,473	689		

Table 43.   Cross Tabulation Analysis (Navy Enlisted by Occupation)

	N		%	
	Not Prior Enlisted	**Prior Enlisted**	**Not Prior Enlisted**	**Prior Enlisted**
Unknown	13,793	864	94%	6%
General & Executive	15	1	94%	6%
Tactical Operations	1,384	205	87%	13%
Intelligence	1,056	93	92%	8%
Engineering & Maintenance	2,803	753	79%	21%
Scientists & Professionals	2,228	98	96%	4%
Health Care	11,241	529	96%	4%
Administrators	2,195	267	89%	11%
Supply, Procurement and Allied	2,094	156	93%	7%
Non-occupational	21,041	504	98%	2%
Total	57,850	3,470		

Table 44.   Cross Tabulation Analysis (Enlisted by Service)

Education		Army	Navy	Marine	Air Force	Total
Not prior Enlisted	N	86,809	59,164	16,326	61,099	223,398
	%	39%	26%	7%	27%	100%
Prior Enlisted	N	289	5,885	1,025	7,251	14,450
	%	2%	41%	7%	50%	100%
Total	N	87,098	65,049	17,351	68,350	237,848
	%	37%	27%	7%	29%	100%

Table 45.   Cross Tabulation Analysis (Army Commissioning Source by Sex)

	N			%		
	Unknown	Male	Female	Unknown	Male	Female
Unknown	52	18,168	3,267	0%	85%	15%
Any Academy	0	2,809	326	0%	90%	10%
Army Academy	0	7,483	562	0%	93%	7%
Navy Academy	0	11	5	0%	69%	31%
Air Force Academy	0	39	3	0%	93%	7%
Merc. Marine Academy	0	12	2	0%	86%	14%
ANG Academy	0	0	0	0%	0%	0%
ROTC Scholarship	0	10,342	2,643	0%	80%	20%
ROTC Non-scholarship	0	20,194	3,517	0%	85%	15%
OCS/OTS	0	3,424	426	0%	89%	11%
Aviation Cadet	0	0	0	0%	0%	0%
National G. State OCS	0	34	6	0%	85%	15%
Direct App. Prof.	1	3,070	673	0%	82%	18%
Direct App. Non-prof.	1	2,552	2,753	0%	48%	52%
AviationTraining Prog.	0	0	0	0%	0%	0%
DirectApp.Warrant Off.	6	2,849	276	0%	91%	9%
Dir.App.C..Warr. Off.	0	0	0	0%	0%	0%
Warr.Off.Aviation.Tr.P.	0	1,554	38	0%	98%	2%
Other Than Above	0	0	0	0%	0%	0%
Total	60	72,541	14,497	0%	85%	15%

Table 46.   Cross Tabulation Analysis (Marine Commissioning Source by Sex)

	N			%		
	Unknown	Male	Female	Unknown	Male	Female
Unknown	0	54	5	0%	92%	8%
Any Academy	0	514	17	0%	97%	3%
Army Academy	0	17	0	0%	100%	0%
Navy Academy	0	1,066	43	0%	96%	4%
Air Force Academy	0	18	0	0%	100%	0%
Merc. Marine Academy	0	9	0	0%	100%	0%
ANG Academy	0	0	0	0%	0%	0%
ROTC Scholarship	0	2,907	159	0%	95%	5%
ROTC Non-scholarship	0	38	1	0%	97%	3%
OCS/OTS	0	7,640	276	0%	97%	3%
Aviation Cadet	0	0	0	0%	0%	0%
National G. State OCS	0	0	0	0%	0%	0%
Direct App. Prof.	0	681	48	0%	93%	7%
Direct App. Non-prof.	0	22	17	0%	56%	44%
Aviation Training Program	0	0	0	0%	0%	0%
Direct App. Warrant Officer	0	11	1	0%	92%	8%
Direct App. Comm. Warr. Off.	0	13	8	0%	0%	0%
Warrant Off. Aviation tr. Prog.	0	617	31	0%	95%	5%
Other Than Above	0	2,936	202	0%	0%	0%
Total	0	16,543	808			

Table 47. Cross Tabulation Analysis (Air Force Commissioning Source by Sex

	N			%		
	Unknown	Male	Female	Unknown	Male	Female
Unknown	1	52	10	2%	83%	16%
Any Academy	0	2,606	324	0%	89%	11%
Army Academy	0	8	4	0%	67%	33%
Navy Academy	0	21	2	0%	91%	9%
Air Force Academy	25	7,090	977	0%	88%	12%
Merc. Marine Academy	0	0	0	0%		0%
ANG Academy	0	11	0	0%	0%	0%
ROTC Scholarship	0	10,680	2,468	0%	81%	19%
ROTC Non-scholarship	0	12,471	1,645	0%	88%	12%
OCS/OTS	2	11,219	1,540	0%	88%	12%
Aviation Cadet	0	4	2	0%	0%	0%
National G. State OCS	0	0	0	0%	0%	0%
Direct App. Prof.	0	5,483	1,297	0%	81%	19%
Direct App. Non-prof.	5	4,207	6,030	0%	41%	59%
Aviation Training Program	0	2	0	0%	0%	0%
Direct App. Warrant Officer	0	0	0	0%	0%	0%
Direct App. Comm. Warr. Off.	0	0	0	0%	0%	0%
Warrant Off. Aviation tr. Prog.	0	0	0	0%	0%	0%
Other Than Above	1	150	13	0%	0%	0%
Total	34	54,004	14,312			

Table 48. Cross Tabulation Analysis (Navy Commissioning Source by Sex)

	N			%		
	Unknown	Male	Unknown	Male	Unknown	Male
Unknown	0	4,832	1,442	0%	77%	23%
Any Academy	0	2,391	191	0%	93%	7%
Army Academy	0	11	1	0%	92%	8%
Navy Academy	0	6,259	702	0%	90%	10%
Air Force Academy	0	26	1	0%	96%	4%
Merc. Marine Academy	0	0	0	0%	0%	0%
ANG Academy	0	0	0	0%	0%	0%
ROTC Scholarship	0	12,541	1,003	0%	93%	7%
ROTC Non-scholarship	0	1,697	190	0%	90%	10%
OCS/OTS	0	10,672	1,093	0%	91%	9%
Aviation Cadet	0	364	4	0%	0%	0%
National G. State OCS	0	0	0	0%	0%	0%
Direct App. Prof.	0	4,127	936	0%	82%	18%
Direct App. Non-prof.	0	7,312	2,811	0%	72%	28%
Aviation Training Program	0	2,346	476	0%	0%	0%
Direct App. Comm. Warr. Off.	0	2,410	93	0%	0%	0%
Warrant Off. Aviation tr. Prog.	0	0	0	0%	0%	0%
Other Than Above	0	919	199	0%	0%	0%
Total	0	55,907	9,142			

Table 49.   Cross Tabulation Analysis (Air F. Commissioning Source by Race/N)

	Unknown	White	Black	Hispanic	Otherrace
Unknown	2	53	6	1	1
Any Academy	17	2,496	187	57	173
Army Academy	0	9	2	1	0
Navy Academy	0	21	0	1	1
Air Force Academy	40	6,887	489	66	610
Merc. Marine Academy	0	0	0	0	0
ANG Academy	0	11	0	0	0
ROTC Scholarship	6	11,736	616	134	656
ROTC Non-scholarship	18	12,171	918	348	661
OCS/OTS	14	11,805	405	222	315
Aviation Cadet	0	5	1	0	0
National G. State OCS	0	0	0	0	0
Direct App. Prof.	5	6,153	211	79	332
Direct App. Non-prof.	10	8,833	851	149	399
Aviation Training Program	0	2	0	0	0
Direct App. Warrant Officer	0	0	0	0	0
Direct App. Comm. Warr. Off.	0	0	0	0	0
Warrant Off. Aviation tr. Prog.	0	0	0	0	0
Other Than Above	54	95	7	1	7
Total	166	60,277	3,693	1,059	3,155

Table 50.   Cross Tabulation Analysis (Air F. Commissioning Source by Race/%)

	Unknown	White	Black	Hispanic	Otherrace
Unknown	3%	84%	10%	2%	2%
Any Academy	1%	85%	6%	2%	6%
Army Academy	0%	75%	17%	8%	0%
Navy Academy	0%	91%	0%	4%	4%
Air Force Academy	0%	85%	6%	1%	8%
Merc. Marine Academy	0%	0%	0%	0%	0%
ANG Academy	0%	100%	0%	0%	0%
ROTC Scholarship	0%	89%	5%	1%	5%
ROTC Non-scholarship	0%	86%	7%	2%	5%
OCS/OTS	0%	93%	3%	2%	2%
Aviation Cadet	0%	83%	17%	0%	0%
National G. State OCS	0%	0%	0%	0%	0%
Direct App. Prof.	0%	91%	3%	1%	5%
Direct App. Non-prof.	0%	86%	8%	1%	4%
Aviation Training Program	0%	100%	0%	0%	0%
Direct App. Warrant Officer	0%	0%	0%	0%	0%
Direct App. Comm. Warr. Off.	0%	0%	0%	0%	0%
Warrant Off. Aviation tr. Prog.	0%	0%	0%	0%	0%
Other Than Above	33%	58%	4%	1%	4%
Total					

Table 51. Cross Tabulation Analysis (Army Commissioning Source by Race/N)

	Unknown	White	Black	Hispanic	Otherrace
Unknown	250	17,512	2,458	351	916
Any Academy	0	2,765	262	3	105
Army Academy	3	7,395	256	130	261
Navy Academy	0	15	1	0	0
Air Force Academy	0	41	1	0	0
Merc. Marine Academy	0	12	1	0	1
ANG Academy	0	0	0	0	0
ROTC Scholarship	2	11,079	1,114	271	519
ROTC Non-scholarship	17	18,110	3,586	944	1,054
OCS/OTS	0	3,103	500	93	154
Aviation Cadet	0	0	0	0	0
National G. State OCS	0	34	3	0	3
Direct App. Prof.	7	3,156	230	89	262
Direct App. Non-prof.	13	4,164	671	132	326
Aviation Training Program	0	0	0	0	0
Direct App. Warrant Officer	95	2,182	571	118	165
Direct App. Comm. Warr. Off.	0	0	0	0	0
Warrant Off. Aviation tr. Prog.	75	1,398	66	20	33
Other Than Above	0	0	0	0	0
Total	462	70,966	9,720	2,151	3,799

Table 52. Cross Tabulation Analysis (Army Commissioning Source by Race/%)

	Unknown	White	Black	Hispanic	Otherrace
Unknown	1%	82%	11%	2%	4%
Any Academy	0%	88%	8%	0%	3%
Army Academy	0%	92%	3%	2%	3%
Navy Academy	0%	94%	6%	0%	0%
Air Force Academy	0%	98%	2%	0%	0%
Merc. Marine Academy	0%	86%	7%	0%	7%
ANG Academy	0%	0%	0%	0%	0%
ROTC Scholarship	0%	85%	9%	2%	4%
ROTC Non-scholarship	0%	76%	15%	4%	4%
OCS/OTS	0%	81%	13%	2%	4%
Aviation Cadet	0%	0%	0%	0%	0%
National G. State OCS	0%	85%	8%	0%	8%
Direct App. Prof.	0%	84%	6%	2%	7%
Direct App. Non-prof.	0%	78%	13%	2%	6%
Aviation Training Program	0%	0%	0%	0%	0%
Direct App. Warrant Officer	3%	70%	18%	4%	5%
Direct App. Comm. Warr. Off.	0%	0%	0%	0%	0%
Warrant Off. Aviation tr. Prog.	5%	88%	4%	1%	2%
Other Than Above	0%	0%	0%	0%	0%
Total					

Table 53.   Cross Tabulation Analysis (Marine Commissioning Source by Race/N)

	Unknown	White	Black	Hispanic	Otherrace
Unknown	0	50	4	4	1
Any Academy	0	450	39	24	18
Army Academy	0	16	1	0	0
Navy Academy	1	933	79	61	35
Air Force Academy	0	17	0	1	0
Merc. Marine Academy	0	9	0	0	0
ANG Academy	0	0	0	0	0
ROTC Scholarship	3	2,817	120	59	67
ROTC Non-scholarship	0	29	7	3	0
OCS/OTS	0	6,786	470	355	305
Aviation Cadet	0	0	0	0	0
National G. State OCS	0	0	0	0	0
Direct App. Prof.	0	0	0	0	0
Direct App. Non-prof.	0	612	77	34	6
Aviation Training Program	0	37	2	0	0
Direct App. Warrant Officer	0	9	2	1	0
Direct App. Comm. Warr. Off.	0	18	1	1	1
Warrant Off. Aviation tr. Prog.	0	562	56	18	12
Other Than Above	0	2,574	278	164	122
Total	4	14,919	1,136	725	567

Table 54.   Cross Tabulation Analysis (Marine Commissioning Source by Race/%)

	Unknown	White	Black	Hispanic	Otherrace
Unknown	0%	85%	7%	7%	2%
Any Academy	0%	85%	7%	5%	3%
Army Academy	0%	94%	6%	0%	0%
Navy Academy	0%	84%	7%	6%	3%
Air Force Academy	0%	94%	0%	6%	0%
Merc. Marine Academy	0%	100%	0%	0%	0%
ANG Academy	0%	0%	0%	0%	0%
ROTC Scholarship	0%	92%	4%	2%	2%
ROTC Non-scholarship	0%	74%	18%	8%	0%
OCS/OTS	0%	86%	6%	4%	4%
Aviation Cadet	0%	0%	0%	0%	0%
National G. State OCS	0%	0%	0%	0%	0%
Direct App. Prof.	0%	0%	0%	0%	0%
Direct App. Non-prof.	0%	84%	11%	5%	1%
Aviation Training Program	0%	95%	5%	0%	0%
Direct App. Warrant Officer	0%	75%	17%	8%	0%
Direct App. Comm. Warr. Off.	0%	86%	5%	5%	5%
Warrant Off. Aviation tr. Prog.	0%	87%	9%	3%	2%
Other Than Above	0%	82%	9%	5%	4%
Total					

Table 55.   Cross Tabulation Analysis (Navy Commissioning Source by Race/N)

	Unknown	White	Black	Hispanic	Otherrace
Unknown	852	4,559	307	129	427
Any Academy	7	2,338	70	62	105
Army Academy	1	8	0	0	3
Navy Academy	28	5,878	343	308	404
Air Force Academy	0	25	1	1	0
Merc. Marine Academy	0	0	0	0	0
ANG Academy	0	0	0	0	0
ROTC Scholarship	32	11,908	648	437	519
ROTC Non-scholarship	13	1,652	116	45	61
OCS/OTS	39	9,848	842	618	418
Aviation Cadet	0	339	8	14	7
National G. State OCS	0	0	0	0	0
Direct App. Prof.	337	4,070	209	184	263
Direct App. Non-prof.	558	8,145	685	343	392
Aviation Training Program	2	2,590	85	105	40
Direct App. Warrant Officer	0	0	0	0	0
Direct App. Comm. Warr. Off.	6	2,007	286	31	173
Warrant Off. Aviation tr. Prog.	0	0	0	0	0
Other Than Above	16	888	139	32	43
Total	1,891	54,255	3,739	2,309	2,855

Table 56.   Cross Tabulation Analysis (Navy Commissioning Source by Race/%)

	Unknown	White	Black	Hispanic	Otherrace
Unknown	14%	73%	5%	2%	7%
Any Academy	0%	91%	3%	2%	4%
Army Academy	8%	67%	0%	0%	25%
Navy Academy	0%	84%	5%	4%	6%
Air Force Academy	0%	93%	4%	4%	0%
Merc. Marine Academy	0%	0%	0%	0%	0%
ANG Academy	0%	0%	0%	0%	0%
ROTC Scholarship	0%	88%	5%	3%	4%
ROTC Non-scholarship	1%	88%	6%	2%	3%
OCS/OTS	0%	84%	7%	5%	4%
Aviation Cadet	0%	92%	2%	4%	2%
National G. State OCS	0%	0%	0%	0%	0%
Direct App. Prof.	7%	80%	4%	4%	5%
Direct App. Non-prof.	6%	80%	7%	3%	4%
Aviation Training Program	0%	92%	3%	4%	1%
Direct App. Warrant Officer	0%	0%	0%	0%	0%
Direct App. Comm. Warr. Off.	0%	80%	11%	1%	7%
Warrant Off. Aviation tr. Prog.	0%	0%	0%	0%	0%
Other Than Above	1%	79%	12%	3%	4%
Total					

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